

IBM Maintenance Library

IBM Maintenance Device Model 2 Maintenance Information

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Preface

This manual is intended for use by IBM customer engineers to isolate problems and repair the IBM Maintenance Device Model 2.

Maintenance Analysis Procedures (MAPs) are the primary means for diagnosing problems in the MD-2. The MAPs are in Chapter 2 of this manual. Each diagnostic procedure starts in the same place in the MAPs. As necessary, the MAPs refer to maintenance information in Chapter 3.

This manual has seven chapters:

- Chapter 1 contains an introduction and a general description of the Maintenance Device.
- Chapter 2 contains the MAPs and a symptom index. That index and the MAPs provide the user with diagnostic procedures for isolating and replacing or adjusting field replaceable units (FRUs).
- Chapter 3 contains maintenance information. This includes service checks, FRU removals and replacements, and wiring diagrams.
- Chapter 4 contains wiring diagrams for the adapter plugs and adapter cables needed to attach the common interface cable to an R-Loop, an S-Loop, a data terminal equipment (DTE), or a data communication equipment (DCE) interface.
- Chapter 5 contains a description of the tools and test equipment required to check and repair the Maintenance Device.
- Chapter 6 contains the parts catalog. All FRUs are identified in this chapter.
- Chapter 7 contains a description of the application and utility programs for the Maintenance Device.

NOTICE

Extreme Cold or Hot Temperatures Can Cause Machine Failures

Storage at cold temperatures (tested to -40°) is not in itself a problem. Condensation which may form when the MD is brought from a cold to a warmer environment can potentially cause power supply or diskette failures. The MD should not be powered on if signs of condensation are present.

The Diskette should not be subjected to temperatures above 52°C (125°F). Jacket distortion can quickly make the diskette unusable.

If the above conditions occur in your geographical area it is recommended that the MD not be stored in an automobile trunk. Transport the MD in the passenger compartment of your vehicle and store overnight in your home or office.

First Edition (April 1981)

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IBM has prepared this maintenance manual for the use of IBM customer engineers in the installation, maintenance, and repair of the specific machines indicated. IBM makes no representations that it is suitable for any other purpose.

The information in this manual is sometimes changed. Any changes will be given in later revisions.

It is possible that this material may contain reference to, or information about, IBM products (machines and programs), programming, or services that are not announced in your country. Such references or information must not be construed to mean that IBM intends to announce such IBM products, programming, or services in your country.

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CE Safety Practices

All Customer Engineers are expected to take every safety precaution possible and observe the following safety practices while maintaining IBM equipment:

1. You should not work alone under hazardous conditions or around equipment with dangerous voltage. Always advise your manager if you MUST work alone.
2. Remove all power AC and DC when removing or assembling major components, working in immediate area of power supplies, performing mechanical inspection of power supplies and installing changes in machine circuitry.
3. Wall box power switch when turned off should be locked or tagged in off position. "Do not Operate" tags, form 229-1266, affixed when applicable. Pull power supply cord whenever possible.
4. When it is absolutely necessary to work on equipment having exposed operating mechanical parts or exposed live electrical circuitry anywhere in the machine, the following precautions must be followed.
 - a. Another person familiar with power off controls must be in immediate vicinity.
 - b. Rings, wrist watches, chains, bracelets, metal cuff links, shall not be worn.
 - c. Only insulated pliers and screwdrivers shall be used.
 - d. Keep one hand in pocket.
 - e. When using test instruments be certain controls are set correctly and proper capacity, insulated probes are used.
 - f. Avoid contacting ground potential (metal floor strips, machine frames, etc. — use suitable rubber mats purchased locally if necessary).
5. Safety Glasses must be worn when:
 - a. Using a hammer to drive pins, riveting, staking, etc.
 - b. Power hand drilling, reaming, grinding, etc.
 - c. Using spring hooks, attaching springs.
 - d. Soldering, wire cutting, removing steel bands.
 - e. Parts cleaning, using solvents, sprays, cleaners, chemicals, etc.
 - f. All other conditions that may be hazardous to your eyes. REMEMBER, THEY ARE YOUR EYES.

6. Special safety instructions such as handling Cathode Ray Tubes and extreme high voltages, must be followed as outlined in CEM's and Safety Section of the Maintenance Manuals.
7. Do not use solvents, chemicals, greases or oils that have not been approved by IBM.
8. Avoid using tools or test equipment that have not been approved by IBM.
9. Replace worn or broken tools and test equipment.
10. Lift by standing or pushing up with stronger leg muscles—this takes strain off back muscles. Do not lift any equipment or parts weighing over 60 pounds.
11. All safety devices such as guards, shields, signs, ground wires, etc. shall be restored after maintenance.
12. Each Customer Engineer is responsible to be certain that no action on his part renders product unsafe or exposes hazards to customer personnel.
13. Place removed machine covers in a safe out-of-the-way place where no one can trip over them.
14. All machine covers must be in place before machine is returned to customer.
15. Always place CE tool kit away from walk areas where no one can trip over it (i.e., under desk or table).
16. Avoid touching mechanical moving parts (i.e., when lubricating, checking for play, etc.).
17. When using stroboscope—do not touch ANYTHING—it may be moving.
18. Avoid wearing loose clothing that may be caught in machinery. Shirt sleeves must be left buttoned or rolled above the elbow.
19. Ties must be tucked in shirt or have a tie clasp (preferably nonconductive) approximately 3 inches from end. Tie chains are not recommended.
20. Before starting equipment, make certain fellow CE's and customer personnel are not in a hazardous position.
21. Maintain good housekeeping in area of machine while performing and after completing maintenance.

KNOWING SAFETY RULES IS NOT ENOUGH
AN UNSAFE ACT WILL INEVITABLY LEAD TO AN ACCIDENT
USE GOOD JUDGMENT — ELIMINATE UNSAFE ACTS

229-1264-1

Glossary and Abbreviation List

ac = alternating current

BISYNC = BInary SYNChronous

bps = bits per second

CCA = common communication adapter

dc = direct current

DCE = data communicating equipment

Directory = diskette table of contents

Displacement = a numeric offset from some given value

DKAN = diskette analysis program

DPCX = distributed processing executive program

DSR = data set ready

DTE = data terminal equipment

Dump = a listing of storage contents

Dump Analyzer = a program to analyze MD program check dumps

EIA = Electronics Industries Association

Extent = a diskette address

File = diskette drive

FRU = field replaceable unit

Gnd = ground

ID = identification

I/O = input/output

IPL = initial program load

K/D = keyboard/display

LED = light emitting diode

Macro = an instruction in a programming language

MAP = maintenance analysis procedure

MD = maintenance device

MDCP = maintenance device control program

MDI = MAP diagnostic integration

MDIL = MAP diagnostic integration language

MIM = maintenance information manual

MPX = multiplex

Parameters = variables passed to a program or controller

PELOG = product engineering log

PIO = programmed input/output (special applications port)

PIOMDA = a type of communication port

POR = power on reset

Port = a communications access

R-Loop = a type of communication port

RFT = request for test

ROS = read only storage

Artificial Respiration
GENERAL CONSIDERATIONS

1. **Start Immediately, Seconds Count**
Do not move victim unless absolutely necessary to remove from danger. Do not wait or look for help or stop to loosen clothing, warm the victim or apply stimulants.
2. **Check Mouth for Obstructions**
Remove foreign objects—Pull tongue forward.
3. **Loosen Clothing—Keep Warm**
Take care of these items after victim is breathing by himself or when help is available.
4. **Remain in Position**
After victim revives, be ready to resume respiration if necessary.
5. **Call a Doctor**
Have someone summon medical aid.
6. **Don't Give Up**
Continue without interruption until victim is breathing without help or is certainly dead.

Rescue Breathing for Adults
Victim on His Back Immediately

1. Clear throat of water, food, or foreign matter.
 2. Tilt head back to open air passage.
 3. Lift jaw up to keep tongue out of air passage.
 4. Pinch nostrils to prevent air leakage when you blow.
 5. Blow until you see chest rise.
 6. Remove your lips and allow lungs to empty.
 7. Listen for snoring and gurglings, signs of throat obstruction.
 8. Repeat mouth to mouth breathings 10-20 times a minute.
- Continue rescue breathing until he breathes for himself.



Thumb and
finger positions



Final mouth
to mouth
position

Reprint Courtesy Mine Safety Appliances
Co.

R/W = read/write

S-Loop = a type of communication port
Sector = a subdivision of a diskette

Target = receiving diskette

Utility = a class of programs

VTOC = volume table of contents

Xmit = transmit

Chapter 1. Introduction to the Maintenance Device Model 2

Maintenance Device Model 2 Description

The Maintenance Device Model 2 (MD-2) is a small portable device used as a maintenance tool for IBM products.

The MD-2 can be operated in stand-alone mode or it can be connected to a product under test. In stand-alone mode, the MD-2 is used to display Maintenance Analysis Procedures (MAPs). When the MD-2 is connected to a product under test, these same MAPs and product MAPs/diagnostic routines are run on the product as part of a maintenance program or because of a product failure. In either mode of operation, the IBM customer engineer is guided in the analysis and repair of the product.

To operate in either mode, as shown in Figure 1-1, the MD-2 uses:

- A diskette drive to read the diskette that contains the MAPs and to write diagnostic information on the diskette. The diskette drive uses a flexible diskette for storage.
- A logic unit for processing and controlling the transfer of information between the diskette and the logic unit. The logic unit also controls the interface to the product under test.
- A keyboard/display (K/D) that lets the customer engineer see specific information from the MAPs and lets the customer engineer make responses, using the keys. The display can display 80 alphanumeric characters. The keyboard has 40 pushbuttons for entering data plus three mode indicators.
- A connector panel that has sockets for data terminal equipment (DTE), data communication equipment (DCE), R-Loop, S-Loop, and Programmed input/output (PIO). The IPL RESET switch is also mounted on the panel.

- A power supply that provides the following voltages:

+24 Vdc
-12 Vdc
+12 Vdc
+8.5 Vdc
+5 Vdc
-5 Vdc

Figure 1-2 shows the data flow within the MD-2. Figure 1-3 shows the MD-2 logic assembly cable and connector locations.

Maintaining the Maintenance Device

When the MD-2 displays a failure symptom message, or fails in a way that fits a failure symptom, the MD-2 is removed from service and another MD-2 is used to complete the customer call.

At the MD-2 repair site, all maintenance activity is controlled by the MD-2 MAPs in Chapter 2 of this manual. "General MD-2 Repair" (see page 2-1) is the starting point for all maintenance activity. The MAPs direct the CE to service checks and FRU replacement procedures in Chapter 3 of this manual.

Repair procedures range from removals and replacements to mechanical adjustments and circuit testing.

Tools and test equipment for maintaining the MD-2 are described in Chapter 5.

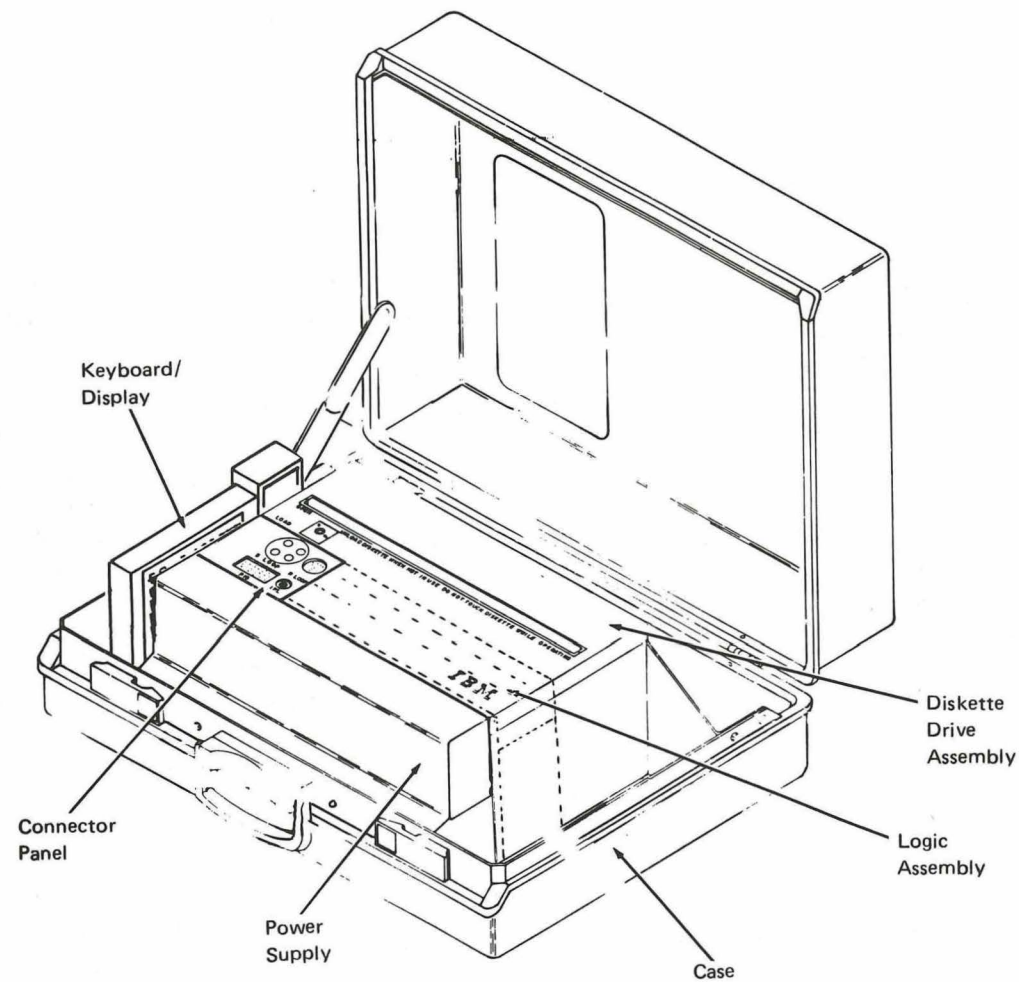


Figure 1-1. Major Components of the MD-2

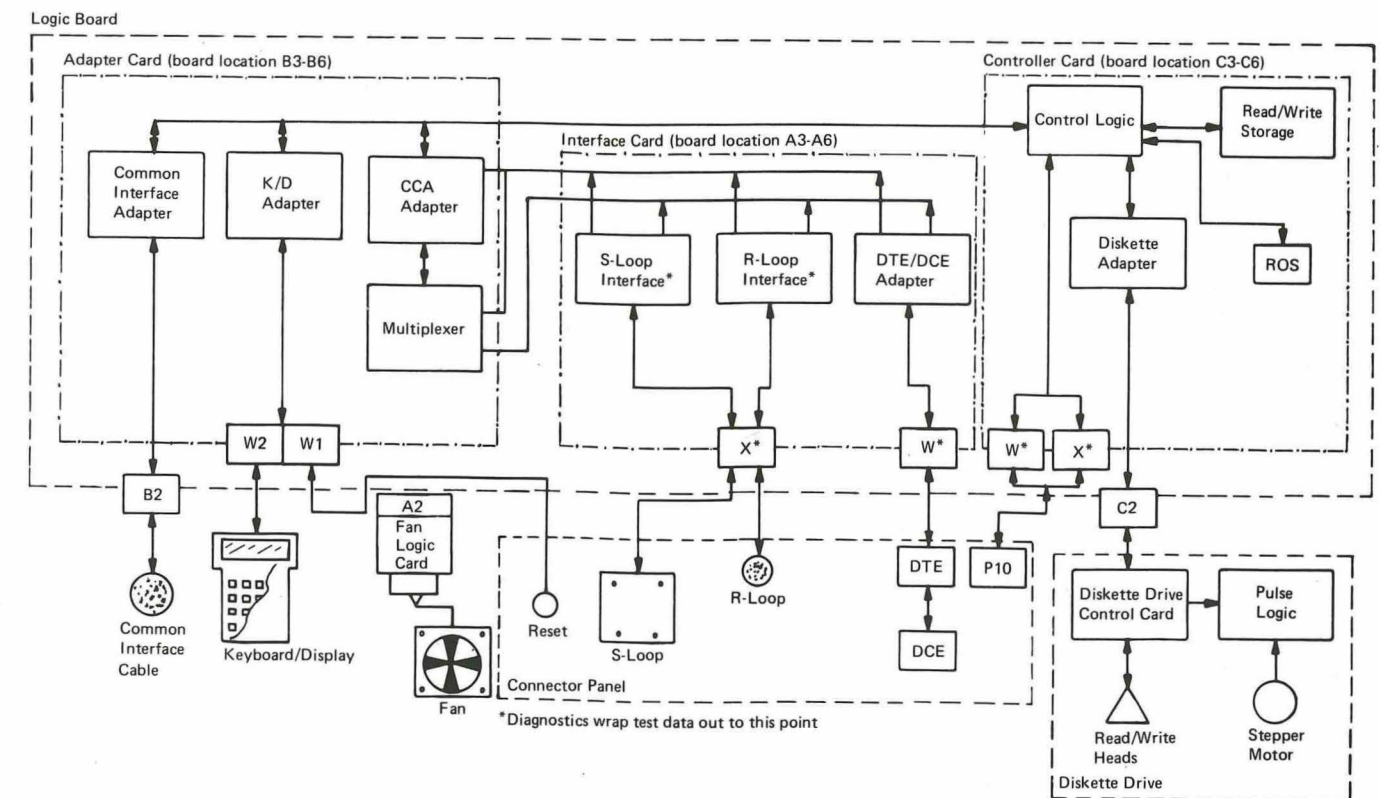


Figure 1-2. MD-2 Functional Data Flow

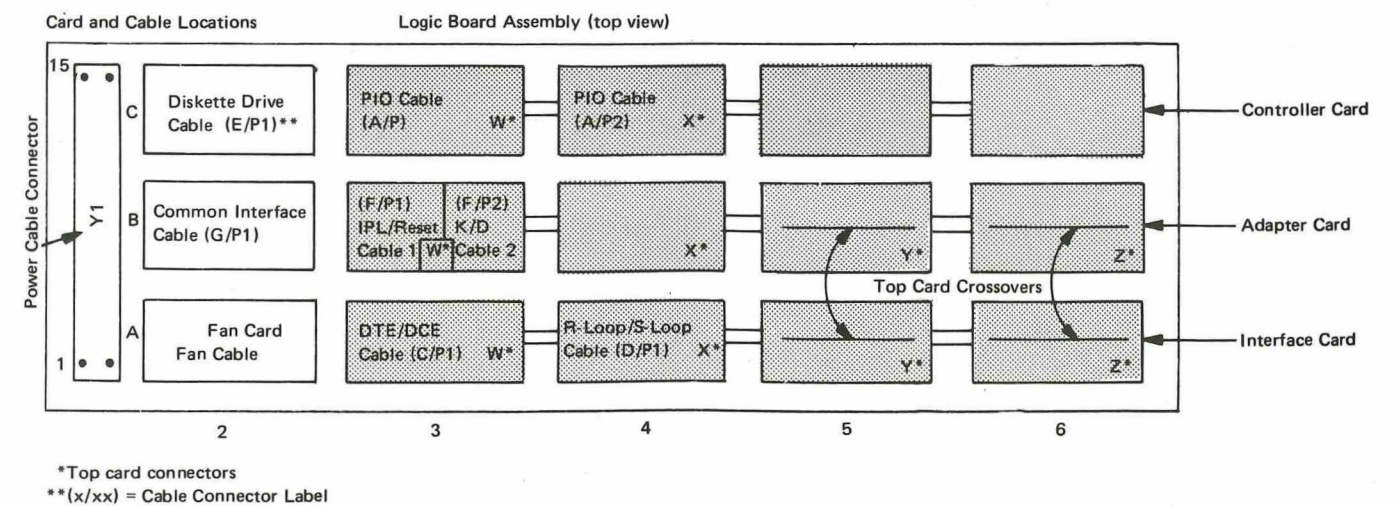


Figure 1-3. MD-2 Logic Assembly Card and Cable Locations

MD-2 Test Description

MD-2 General Diagnostic Test Information
See the MD-2 data flow Figure 1-2. In addition to showing the physical location of logic in the MD-2, this figure shows data flow between logic card areas.

The amount of the MD-2 tested is determined by the type of diskette (maintenance or product support) installed in the MD-2. Each test makes decisions by analyzing data on the diskette or in read/write (R/W) storage.

If an MD-2 maintenance diskette is installed for repair purposes, the total MD-2 can be tested, and errors sensed are reported immediately. All read-only-storage (ROS) error symptoms are serviced using the symptom index. The extended tests and communication tests have both SOFTMAPs and a symptom index to aid in finding the failing FRU(s).

If a product diskette is installed, the goal of the MD-2 is to complete the job assigned to the diskette. The MD-2 operates as long as hardware, needed to do the job, is operating. Any errors are reported as follows:

- Immediately during ROS and extended testing for all hardware required to do the job.
- Immediately if the needed hardware develops a solid failure during the job.
- After the job ends if the needed hardware had too many intermittent failures.
- After the job ends if the hardware in which the errors are sensed by the extended tests is not needed for the completion of the job.

Note: A fast IPL is one in which some ROS tests and all extended tests are bypassed. It is available on the MD-2 by pressing the IPL RESET switch after a complete IPL sequence of a product diskette. The fast IPL is not available if the MD-2 maintenance diskette is installed.

To fully test the MD-2, perform the following steps:

Warning: Do not power the MD-2 on or off with a diskette installed and loaded. The data on the diskette can be destroyed if this is done.

1. Power on the MD-2 if it is off.
2. Install the MD-2 maintenance diskette.

3. Set the LOAD/OPEN lever to LOAD. This loads the R/W heads against the diskette.
4. Press the IPL RESET switch. This performs a reset sequence that automatically starts testing the MD-2.

You can initiate the optional tests by responding to questions as they are displayed. To fully test the MD-2, execute all the following tests:

TEST NAME	EXECUTED	LOCATED
ROS test-----	(auto)-ROS	
Extended IPL test----	(auto)-all diskettes	
Port wrap test-----	(opt)--maintenance diskette	
K/D verification test--	(opt)--maintenance diskette	
Performance analysis--	(auto)-all diskettes	
Education module-----	(opt)--maintenance diskette	
Utility programs-----	(opt)--maintenance diskette	

ROS Test Descriptions

The ROS test is located in ROS and is started by turning on power to the MD-2 or pressing the IPL RESET switch. The ROS test is divided into the following two sections.

- Section 1 — tests the MD-2 controller, ROS, and R/W storage.
- Section 2 — tests the diskette drive.

ROS Test - Section 1

Section 1 of the ROS test tests the controller, ROS, and R/W storage in the MD-2. The following progress codes are displayed as the test run:

DISPLAY	TEST IN PROGRESS
Blank	MD-2 controller logic
1	R/W head seeks forward
12	MD-2 controller logic
123	MD-2 controller logic
1234	MD-2 controller logic
12345	Read/Write storage
123456	MD-2 controller logic
1234567	R/W head seeks backward
12345678	MD-2 controller logic
	MD-2 controller logic

If an error is sensed, testing stops. The character displayed indicates the ROS test that sensed the error. See the following chart.

ERROR SYMPTOM	ERROR SENSED
Blank	In MD-2 controller logic while head seeks forward
1	In MD-2 controller logic
12	In MD-2 controller logic
123	In MD-2 controller logic
1234	In Read/Write storage
12345	In MD-2 controller logic
123456	While head seeks backward
1234567	In MD-2 controller logic
12345678	In MD-2 controller logic
12345678 A	In I/O bus
12345678 B	In I/O bus
12345678 C	In I/O bus
12345678 D	In I/O bus
12345678 E	In I/O bus

If no error is sensed, ROS test section 2 is executed.

ROS Test - Section 2

Section 2 of the ROS test tests the MD-2 diskette drive. When the test starts, the message 29 FILE TEST is displayed on the first line of the K/D. When the tests are executing, characters 26, 2A, 2B, 2C, 2D, 2E, and 2F are displayed, indicating that the test is running.

If an error is sensed, testing stops, FILE TEST is displayed on the top line of the K/D, and one of the following error symptoms is displayed on the second line of the K/D:

ERROR SYMPTOM	ERROR SENSED
04	Machine check
20	Invalid function requested
21 - 25	Error sensed in diskette adapter electronics
26	Initialize
27	Read errors, head 0
28	Read errors, head 1
2A	Access test
2B	Seek to cylinder 5 and read the ID
2C - 2E	Diskette read errors
2F	Loading diskette data
50 - 57	Head 0 errors while writing, reading, or comparing a 1's and then a 0's patterns.
58 - 5F	Head 1 errors while writing, reading, or comparing a 1's and then a 0's patterns.

If an error is sensed when ROS uses the common adapter code (CAC), the following error symptoms are displayed:

ERROR SYMPTOM	ERROR SENSED
70	File speed not correct
71	Data overrun
	Parity error
	Adapter error
	Write control error
	Data overrun
	R/W heads not loaded
72	Write current errors during a write or the wrong head was selected during a read
73	Seek error
74	Data overrun
75	Write current error during a read
76	Deleted sector found on diskette
77	Defective sector found on diskette
78	Read error or data field not found
79	Sector ID not found
7A	Invalid sector ID found

ROS Test Messages and Descriptions

DISK SLOW XX.XX MS

Diskette speed too slow.

(XX.XX = number of milliseconds)

DISK FAST XX.XX MS

Diskette speed too fast.

(XX.XX = number of milliseconds)

FILE NOT READY

Diskette is not running.

Diskette is not installed correctly.

Logic that senses diskette is turning has failed.

If section 2 of the ROS test runs successfully, the extended tests are loaded from diskette.

ROS Cyclic Test

The ROS cyclic test is located in ROS and is composed of selected portions of the ROS tests. The MD-2 continuously cycles through this test instead of being in a wait status. This test requires approximately 1.8 seconds to run with no interruptions. This test does not do any write operations, but tests the machine status registers by reading them. Hardware error-checking senses errors, and they are displayed by the

machine-check handler of the application software.

Extended IPL Test Descriptions

The extended IPL test is located on all diskettes and is loaded into R/W storage by instructions located in ROS. If all ROS tests are executed without error, the remainder of the MD-2 that does not need manual intervention is tested.

- If an MD-2 maintenance diskette is installed and no errors are sensed by the extended IPL test, the diskette drive head-alignment routine is initiated. This test verifies the head alignment by reading the sector addresses from tracks 12, 22, 32, 42, 52, 62, and 72. Any solid errors sensed are displayed. To correct errors, try another diskette, and if the errors are still present, perform the head/carriage alignment. Pressing any key permits testing to continue.
- After all the extended IPL tests that do not require manual intervention have been run (approximately 55 seconds), the following message is displayed:

MAINTENANCE DEVICE
MAINTENANCE AND
APPLICATION
DISKETTE

Press the FORWARD or ENTER keys to continue. If the extended IPL test senses an error, the SOFTMAP routine displays the error symptom and the FRUs to correct the error.

- If no errors are sensed by the extended IPL test, additional testing is done by responding to questions displayed on the K/D. See Figure 1-4 for the proper responses to the questions displayed at the end of extended IPL test to run additional tests.
- If a product diskette is installed and no errors are sensed by the extended IPL test, the diskette job is loaded and executed.
- If errors are sensed in the MD-2 hardware needed to execute the job, they are displayed

and the extended IPL test stops. Repair this MD or get another one to continue product testing.

- If errors are sensed in MD-2 hardware not needed to execute the job, these errors are stored until the end of job. The errors are displayed at the end of job and the MD-2 status is analyzed to determine what action is necessary to repair the MD-2.

Areas tested by the extended IPL test are as follows:

K/D adapter and the K/D
PIOMDA adapter
MPX adapter
CCA adapter
DTE/DCE adapter
R-LOOP adapter
S-LOOP adapter
Diskette drive head/carriage
alignment/seek.

Note: The PIO connector circuit is not tested by any of the MD-2 maintenance diagnostic routines. The application using the PIO circuit must verify that the PIO circuit is operational.

Extended IPL Test Error Symptoms

ERROR SYMPTOM	ERROR SENSED
10 — 12	K/D adapter errors
13	Data wrap error
14 — 1F	K/D adapter through K/D
30 — 3F	K/D adapter errors
40 — 4F	PIOMDA adapter errors
60 — 6F	MPX adapter errors
70 — 7F	CCA adapter errors
A0 — A8	CCA adapter errors
	Data wrap errors
	in CCA, MPX, and
	R-Loop adapters
B0 — B8	Data wrap errors
	in CCA, MPX, and
	S-Loop adapters

Extended IPL Test Messages

The following are extended IPL test messages. If any message is displayed continuously, exchange the diskette.

MESSAGE	DESCRIPTION
MD EXTENDED TESTING	The extended IPL test has started.
MD EXTENDED TESTING LOADING SYSTEM DIRECTORY RECORD FROM DISKETTE CYL 5	The extended IPL test is loading the system directory records into R/W storage.
MD EXTENDED TESTING ERROR MDD71X DISKETTE ERROR DISKETTE ERROR CYL 5	The extended IPL test sensed an error when reading the system directory record from diskette.
MD EXTENDED TESTING ERROR 71X DISKETTE ERROR SDR X'OF' MISSING	The extended IPL test cannot find diskette ID byte in system directory.
MD TESTING COMPLETE LOADING APPLICATION IPL LOADER FROM DISKETTE CYL 6	The extended IPL test sensed no errors and is loading the IPL loader program into R/W storage.
MD TESTING COMPLETE ERROR MDD71X DISKETTE ERROR DISKETTE ERROR CYL 6	The Extended IPL test sensed an error when reading IPL loader from diskette.
MCPC nn nn nn nn nn	Machine Check Program Check (MCPC). (See "Machine Check Program Check Error Symptoms" in Chapter 2 of this manual.)

No errors were sensed by the extended IPL tests

MAINTENANCE DEVICE
MAINTENANCE AND
APPLICATION
DISKETTE

Press FORWARD or ENTER keys

DO YOU WANT TO REPAIR/TEST THIS MD?
N Y
DO YOU WANT TO TEST THE COMMUNICATION PORTS?
N Y
Follow the instructions on the keyboard/display.
DO YOU WANT TO RUN THE K/D FUNCTION TEST?
N Y
Follow the instructions on the keyboard/display.
MD REPAIR/INSTALL TESTING COMPLETE.

DO YOU WANT TO RUN THE MD EDUCATION MODULE?
N Y
Follow the instructions on the keyboard/display.

SELECT ACTIVITY

- 1 = MAP EXERCISE - (Sample SOFTMAPs)
- 2 = APPLICATIONS - (See Chapter 7, "MD Application/Utility Programs")
- 3 = END

Select number, press ENTER, and follow instructions displayed on the keyboard/display.

Figure 1-4. Responses to Select MD-2 Optional Tests

Port Wrap Test Description

The port wrap Tests are optional tests found only on the MD-2 maintenance diskette. See Figure 1-4 for the proper responses to the questions displayed at the end of extended IPL test to run the port wrap tests.

Port wrap plugs (*not communication adapters*) are needed to correctly test all of the communication ports. The port wrap plugs are specially wired for test purposes. Data is wrapped through the port wrap plugs to test the PIOMDA, R-Loop and S-Loop through the common interface cable and their specific sockets. The DTE port is wrapped at the MD-2 control panel or at the end of the DTE interface cable by using the DTE wrap plug. There are two passes to these tests. Each pass needs a different port wrap plug setup. The setup instructions are displayed on the K/D.

Any errors sensed are displayed after the end of both passes. The SOFTMAP routine for MD-2 displays the probable failing FRUs in the sequence in which they are to be exchanged.

Port Wrap Test Error Symptoms

PASS 1	PASS 2	AREA TESTED
101 — 126	601 — 626	DTE/DCE
201 — 208	701 — 708	S-Loop
301 — 308	801 — 808	R-Loop
401 — 408		PIOMDA

K/D Verification Test Description

The K/D verification test is an optional test found only on the MD-2 maintenance diskette. See Figure 1-4 for the proper responses to the questions displayed at the end of extended IPL test to run the K/D verification test.

The user can verify that all the light emitting diodes (LEDs) in the display operate correctly and that all keys function correctly in either shift. The K/D verification test has two sections. The user is given the option to run either or both sections of the test.

The first section displays various characters in a pattern that will highlight missing or extra LEDs in the display.

The second section prompts the user to operate all keys in a specific sequence and to visually verify, by comparison, that the keys operate correctly. The user may select his own key sequence.

No error symptoms are displayed for this test. Verification of correct K/D operation is by means of visual observations.

Performance Analysis Description

The performance analysis procedure occurs automatically at the end of the job if the procedure is on the product diskette. It analyzes all hardware errors recorded and reports them as follows:

- It reports errors that were recorded by the extended IPL test for communication I/O devices not required for the job.

- It reports if too many errors are recorded for all I/O devices during execution of the job (online).
- It reports for K/D and diskette drive symptoms of errors that are sensed during execution of the job (online) and from which it cannot recover.

Performance Analysis Error Symptoms

ERROR SYMPTOM	ERROR SENSED
MDH70L	Too many online diskette drive errors (not diskette).
MDH70U	Diskette drive error not recovered (not diskette).
MDD71L	Too many online diskette errors (not diskette drive).
MDD71U	Diskette error not recovered (not diskette drive).
MDD71X	Diskette error not recovered was sensed by the extended tests.
MDH72L	Too many online K/D errors.
MDH72U	K/D error not recovered
MDH73L	Too many online DTE/DCE errors.
MDH73X	Deferred extended IPL DTE/DCE error.
MDH74L	Too many online PIOMDA errors.
MDH74X	Deferred extended IPL PIOMDA error.
MDH75L	Too many online R-Loop errors.
MDH75X	Deferred extended IPL R-Loop error.
MDH76L	Too many online S-Loop errors.
MDH76X	Deferred extended IPL S-Loop error.

Chapter 2. Maintenance Analysis Procedures

General MD-2 Repair and Repair Verification Procedure

Before removing the covers, verify that the MD-2 is failing by running the diagnostic tests using the MD-2 maintenance diskette.

WAS AN ERROR SYMPTOM SENSED

N Y
For ROS test error symptoms, use the error symptom index to select FRUs; for extended or communication test error symptoms, use either SOFTMAP or error symptom index to select FRUs. Exchange FRUs in sequence; the removal instructions are in Chapter 3. Verify repairs by running all diagnostic tests.

DID DIAGNOSTICS RUN SUCCESSFULLY.

Y N
If exchanging all the FRUs did not correct error, check all voltages. See page 3-8 for voltage test points. Inspect crossover connectors between adapter and interface cards (see page 3-6). Verify that all cards and cables are seated properly. Call for help if error symptom is not corrected.

Record repair action and return MD-2 to user.

When the diagnostic tests fail to sense an error, do the following:

1. Remove top service cover.
2. Check MD-2 for: fan running, cables and cards seated properly.
3. Verify that all voltages are correct (see page 3-8 for voltage test points).

WAS A VISUAL ERROR NOTED THAT COULD CAUSE ORIGINAL FAILURE?

N Y
Repair failure and test MD-2 by running all diagnostic tests. Record repair action on IPAR form. Return MD-2 to user.

Check the past failure records for this MD-2.

HAS THE ERROR SYMPTOM RECORDED ON ERROR FORM BEEN PREVIOUSLY REPORTED?

Y N
See symptom index and exchange the first FRU listed for error symptom. Verify repair by running all diagnostic tests. Record repair action on IPAR form. Return MD-2 to user.

Verify any earlier repair action. See symptom index; exchange the next FRU in list. Verify repair by running all diagnostic tests. Return MD-2 to user.

If all FRUs have been exchanged and the MD-2 is still failing, call for help.

Symptom Index

Entry Point A

- Find the error symptom in the following tables.
- Perform service checks and/or exchange the FRUs listed, one at a time, until the failing FRU is identified. The FRUs and service checks are listed in a probable-cause sequence.

Note: You may find servicing the MD-2 easier by making the service checks listed for an error symptom before exchanging the listed FRUs for that error symptom.

- The SOFTMAPs will call out the FRUs for extended and communications test error symptoms. All SOFTMAP error symptoms may not be listed in the symptom index. The symptoms and FRUs not listed in the index should be recorded on the Reader's Comment Form and mailed.
- Always verify that cables and crossovers are connected correctly and not damaged.

Caution: Ensure that power is removed from the MD-2 before any FRU is exchanged.

- Disconnect an assembly from the logic circuitry before making any resistance measurements on the assembly.
- Ensure that the power warning label is replaced if removed.

Machine Check Program Check Error Symptoms

Error Symptoms	FRU/Procedure List	Go To
MCPC 1n nn nn nn nn nn nn n = any character	Controller Card Exchange Diskette	3-5
MCPC 2n nn nn nn nn nn nn n = any character)	Controller Card	3-5
MCPC 4n nn nn nn nn nn nn n = any character	Adapter Card Diskette Control Card Controller Card Exchange Diskette	3-5 3-41 3-5
MCPC 8n nn nn nn nn nn nn n = any character	Adapter Card Diskette Control Card Controller Card Head/Carriage Asm	3-5 3-41 3-5 3-43

ROS Error Symptoms

Error Symptoms	FRU/Procedure List	Go To
Blank display. No head carriage access. Fan and file drive motor does not run.	Power service check	3-9
Blank display. No head carriage access. Fan and file drive motor run.	Controller Card Adapter Card Interface Card Power service check PIO Cable, Jumpers in Controller top card cable connector	3-5 3-9 3-21
Blank display. Head carriage accesses several times. Fan and file drive motor run.	Keyboard/Display Unit Adapter Card Interface Card Controller Card Verify +5 Vdc on K/D power connector B/P3	3-25 3-5 3-5 3-5 3-12
Display characters are not readable. No head carriage access. Fan and file drive motor run.	Controller Card Adapter Card Interface Card Power service check	3-5 3-5 3-5 3-9
Display characters are not readable. Head carriage accesses several times. Fan and file drive motor run.	Adapter Card Controller Card Interface Card Keyboard/Display Unit	3-5 3-5 3-5 3-25
Display has missing or extra dots.	Keyboard/Display Unit	3-25
Display characters are incorrect.	Adapter Card	3-5
Display blank after flashing error.	Adapter Card	3-5
IPL RESET switch fails to IPL unit. When powered on, the unit IPLs correctly.	IPL Reset Switch Adapter Card	3-21 3-5
Fan fails to run.	Fan Logic Card Fan	3-14
Fan runs slowly; diagnostics run correctly when unit is powered on.	Fan Logic Card Fan	3-14

Error Symptoms	FRU/Procedure List	Go To
1	Controller Card Adapter Card	3-5 3-5
1 2	Controller Card Adapter Card	3-5
1 2 3	Controller Card	3-5
1 2 3 4	Controller Card	3-5
1 2 3 4 5	Controller Card	3-5
1 2 3 4 5 6	Controller Card	3-5
1 2 3 4 5 6 7	Controller Card	3-5
1 2 3 4 5 6 7 8	Controller Card	3-5
1 2 3 4 5 6 7 8 A	Adapter Card Controller Card	3-5
1 2 3 4 5 6 7 8 B	Adapter Card Controller Card	3-5
1 2 3 4 5 6 7 8 C	Adapter Card Controller Card	3-5
1 2 3 4 5 6 7 8 D	Adapter Card Controller Card	3-5
1 2 3 4 5 6 7 8 E	Adapter Card Controller Card	3-5
FILE SLOW BY XX.XX MS (XX = MILLI-SECONDS)	Ensure that there are no cables binding against the diskette Diskette Drive Motor adjustment Diskette Drive Belt Controller Card	3-31
FILE FAST BY XX.XX MS (XX = MILLI-SECONDS)	Diskette Drive Motor adjustment Controller card	3-31 3-5

2-4

Error Symptoms	FRU/Procedure List	Go To
29 FILE TEST FILE NOT READY	Verify diskette is inserted correctly	
	If diskette is turning, check:	
	Index LED and PTX	
	service checks	3-35
	Zero Stop Card	3-41
	Diskette Control Card	3-41
	Controller Card	3-5
	Verify Cable "H"	3-49
	Verify Cable "E"	3-49
	Verify +5 Vdc at CD8-2 (+)	
	CD8-1 (-) and CD3-7 (+)	
	CD3-8 (-)	3-12
	If Diskette is not turning, check:	
	Diskette Drive Belt	
	Diskette Drive Motor Asm	3-31
	Head load assembly/collet	3-33
	Verify +24 Vdc at Conn B/P4	3-12
	If no +24 Vdc at connector B/P4, check power supply/distribution	3-9
MD FILE ERROR 20	Controller Card	3-5
	Adapter Card	3-5
	Diskette Control Card	3-41
	Verify Cable "E"	3-49
29 FILE TEST 26	Zero Stop LED and PTX	
	service checks	3-37
	Controller Card	3-5
	Zero Stop Card	3-41
	Diskette Control Card	3-41
	Head Carriage	3-43
	Stepper Motor service check	3-39
	Verify Cable "E"	3-49
	Verify Cable "H"	3-49
29 FILE TEST 2A	Controller Card	3-5
	Diskette Control Card	3-41
29 FILE TEST 26 2B	Exchange Diskette	
	Zero Stop Card	3-41
	Diskette Control Card	3-41
	Controller Card	3-5
	Head Carriage	3-43
	Zero Stop LED and	
	PTX service checks	3-35
	Verify Cable "E"	3-49
	Verify Cable "H"	3-49
	Stepper Motor check	3-39
MD FILE ERROR 27	Exchange Diskette	
	Controller Card	3-5
	Diskette Control Card	3-41

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ROS Error Symptoms (continued)

Error Symptoms	FRU/Procedure List	Go To
MD FILE ERROR 28	Exchange Diskette Controller Card Diskette Control Card	3-5 3-41
29 FILE TEST 2C	Exchange Diskette Zero Stop LED and PTX service checks Controller Card Stepper Motor Verify Cable "E" Zero Stop Card	3-37 3-5 3-39 3-49 3-41
29 FILE TEST 2D	Exchange Diskette	
29 FILE TEST 2E	Exchange Diskette	
MD ROS FILE ERROR 23	Diskette Control Card Controller Card Check -5 Vdc on Diskette Control card pin D11; the -5 Vdc missing may cause damage to the diskette	3-41 3-5 3-49
MD ROS FILE ERROR 5n 5n 5n 5n nn nn -- -- (n = any or no characters)	Head Carriage Controller Card Diskette Control Card Power Supply sense output pin 19 and 20 on B/P1 Verify Cable "E"	3-43 3-5 3-41 3-9 3-49
MD ROS FILE ERROR 5B	Diskette Control Card Verify Cable "E"	3-41 3-49
MD ROS FILE ERROR 71 through 79	Exchange Diskette Zero Stop Card Controller Card Diskette Control Card Zero Stop LED and PTX service checks Head Carriage Stepper Motor service check Verify Cable "E"	3-41 3-5 3-41 3-37 3-43 3-39 3-49

Extended IPL Error Symptoms

MD EXTENDED ERRORS is displayed on line 1. Error symptom codes are displayed on lines 2 and 3.

Error Symptoms	FRU/Procedure List	Go To
10	Adapter Card Controller Card	3-5
11	Adapter Card Controller Card	3-5
12	Adapter Card Controller Card	3-5
12 13	Adapter Card Interface Card	3-5
12 A4 A7	Interface Card	3-5
13	Adapter Card	3-5
30	Controller Card Adapter Card	3-5
31	Adapter Card	3-5
32	Adapter Card Interface Card	3-5
32 66 B7	Adapter Card Interface Card	3-5
32 66 B2 B7	Adapter Card Interface Card	3-5
32 B2 B7	Adapter Card Interface Card	3-5
40 41 42 68 A1 A4 A7 B1 B4 B7	Adapter Card	3-5
60	Adapter Card	3-5
60 A1 A3 A7 B1 B4 B7	Adapter Card	3-5
60 A1 A4 A7 B1 B4 B7	Adapter Card	3-5

Extended IPL Error Symptoms (continued)

Error Symptoms	FRU/Procedure List	Go To
60 A1 A4 A8 B1 B4 B8	Adapter Card	3-5
61	Adapter Card	3-5
61 A8 B8	Adapter Card	3-5
62	Adapter Card	3-5
62 A1 A7 B1 B7	Adapter Card	3-5
62 A1 A8 B1 B8	Adapter Card	3-5
62 A4 B4	Adapter Card	3-5
62 A8 B8	Adapter Card	3-5
63	Adapter Card Interface Card	3-5
63 A1 A4 A7 B1 B4 B7	Adapter Card Interface Card	3-5
63 A4 A7 B4 B7	Adapter Card Interface Card	3-5
63 A6	Adapter Card Interface Card	3-5
64	Adapter Card	3-5
65	Adapter Card	3-5
66	Adapter Card Interface Card	3-5
67	Adapter Card	3-5
68	Adapter Card	3-5
68 A6 A7 B7	Adapter Card	3-5

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Extended IPL Error Symptoms (continued)

Error Symptoms	FRU/Procedure List	Go To
68 A7 B7	Adapter Card	3-5
68 A8 B8	Adapter Card	3-5
69	Adapter Card Interface Card	3-5
70	Adapter Card Interface Card	3-5
71	Adapter Card Interface Card	3-5
72	Adapter Card Interface Card	3-5
73	Adapter Card Interface Card Controller Card	3-5
74	Adapter Card Interface Card	3-5
75	Adapter Card Interface Card	3-5
78	Adapter Card Interface Card	3-5
A1	Adapter Card Interface Card	3-5
A1 A4 A7	Adapter Card Interface Card	3-5
A1 A4 B1 B5	Adapter Card Interface Card	3-5
A1 A5 A7	Adapter Card Interface Card	3-5
A1 A6 B1 B6	Adapter Card Interface Card	3-5

Extended IPL Error Symptoms (continued)

Error Symptoms	FRU/Procedure List	Go To
A1 A8 B1 B7	Adapter Card Controller Card	3-5
A1 B1	Adapter Card Interface Card	3-5
A1 B2	Adapter Card Interface Card	3-5
A2 A7 B2 B7	Adapter Card Controller Card Interface Card	3-5
A3 A7	Interface Card	3-5
A3 A8	Interface Card	3-5
A3 B3	Adapter Card	3-5
A4	Interface Card Adapter Card	3-5
A4 A7	Adapter Card Interface Card	3-5
A4 A7 B5	Interface Card Adapter Card	3-5
A4 A7 B7	Adapter Card Interface Card	3-5
A6 A7	Adapter Card Interface Card	3-5
A6 A7 B7	Adapter Card Interface Card	3-5
A6 B1 B6	Adapter Card Interface Card	3-5
A7	Adapter Card Interface Card	3-5

Extended IPL Error Symptoms (continued)

Error Symptoms	FRU/Procedure List	Go To
A7 B5 B7	Adapter Card Interface Card	3-5
A7 B7	Adapter Card Interface Card	3-5
A8	Interface Card	3-5
B1	Adapter Card Interface Card	3-5
B1 B4 B7	Interface Card Adapter Card	3-5
B1 B5	Interface Card	3-5
B1 B5 B7	Adapter Card Interface Card	3-5
B1 B6	Adapter Card Interface Card	3-5
B2	Adapter Card Interface Card	3-5
B2 B4 B7	Adapter Card Interface Card	3-5
B2 B7	Interface Card	3-5
B3	Adapter Card Interface Card	3-5
B3 B8	Adapter Card Interface Card	3-5
B4 B7	Interface Card Adapter Card	3-5
B5	Interface Card	3-5
B5 B7	Interface Card	3-5

Extended IPL Error Symptoms (continued)

Error Symptoms	FRU/Procedure List	Go To
B5 B8	Adapter Card Interface Card	3-5
B6	Interface Card	3-5
B7	Interface Card Adapter Card	3-5
B8	Interface Card Adapter Card	3-5
K/D TEST	Controller Card Adapter Card	3-5
S Loop TEST	Adapter Card	3-5
ERROR MDD71X DISKETTE ERROR DISKETTE ERROR CYL 5	Exchange Diskette	
ERROR MDD71X DISKETTE ERROR DISKETTE ERROR CYL 6	Exchange Diskette	
ERROR MDD71X DISKETTE ERROR SDR X'OF' MISSING	Exchange Diskette	
ERRORS ON CYLINDER xx xx = Failing cylinder	Exchange Diskette Head/Carriage alignment Diskette Control Card Controller Card	3-45 3-41 3-5
If the following message remains after FORWARD or ENTER is pressed:		
MAINTENANCE DEVICE MAINTENANCE AND APPLICATION DISKETTE	Keyboard/Display Unit Adapter Card	3-25 3-5

Extended IPL Test Messages
The following are extended test messages.
If any message is displayed continuously,
exchange the diskette.

MESSAGE

MD EXTENDED TESTING

MD EXTENDED TESTING
LOADING SYSTEM
DIRECTORY RECORD
FROM DISKETTE CYL 5

MD EXTENDED TESTING
ERROR MDD71X
DISKETTE ERROR
DISKETTE ERROR CYL 5

MD EXTENDED TESTING
ERROR 71X
DISKETTE ERROR
SDR X'OF' MISSING

MD TESTING COMPLETE
LOADING APPLICATION
IPL LOADER FROM
DISKETTE CYL 6

MD TESTING COMPLETE
ERROR MDD71X
DISKETTE ERROR
DISKETTE ERROR CYL 6

Communication Wrap Error Symptoms

MD PORT WRAP ERROR is displayed on line 1. Error symptom codes are displayed on lines 2 and 3.

Error Symptoms	FRU/Procedure List	Go To
1nn n = any character	Interface Card Adapter Card DTE/DCE Internal Cable	3-5 3-17
1nn 6nn n = any character	Interface Card Adapter Card DTE/DCE Internal Cable	3-5 3-17
105 201 303 402 605 801	NOT VALID OPERATION – Communication adapter plugs used instead of port wrap plugs	
105 201 402 605 801	NOT VALID OPERATION – Communication adapter plugs used instead of port wrap plugs	
105 605	Interface Card Adapter Card DTE/DCE Internal Cable	3-5 3-5 3-17
	Verify -12 Vdc at Power Conn B\P1 pin 13 and +12 Vdc at Power Conn B\P1 pin 14.	3-8
	If no -12 Vdc or +12 Vdc – DC Power Supply DC Distribution Cable "B"	3-11 3-12
109 301 609 901	Interface Card Adapter Card	3-5
2nn n = any character	Interface Card Adapter Card S-Loop Cable Asm	3-5 3-23
2nn 7nn n = any character	Interface Card Adapter Card Common Interface Cable S-Loop Cable Asm	3-5 3-19
2nn 8nn n = any character	Interface Card Adapter Card Common Interface Cable S-Loop Cable Asm	3-5 3-19 3-23
203 302 703 802	Adapter Card	3-5

Communication Wrap Error Symptoms (continued)

Error Symptoms	FRU/Procedure List	Go To
3nn n = any character	Interface Card Adapter Card Common Interface Cable R-Loop Cable Asm	3-5 3-19 3-23
3nn 8nn n = any character	Interface Card Adapter Card Common Interface Cable R-Loop Cable Asm	3-5 3-19 3-23
4nn n = any character	Adapter Card Common Interface Cable	3-5 3-19
6nn n = any character	DTE/DCE Cable	3-17
7nn n = any character	Interface Card S-Loop Cable Asm	3-5 3-23
8nn n = any character	Adapter Card Interface Card Common-Interface Cable	3-5 3-5 3-19

On Line Error Symptoms

Error Symptoms	FRU/Procedure List	Go To
MDH10 K/D ERROR	Interface Card	3-25
PRESS ENTER ONLY	Adapter Card Keyboard/Display Unit	3-5
MDD11 DISK ERROR RETRYING I/O	Exchange Diskette Controller Card Diskette Control Card	3-5 3-41
MDH16 MCPC-10 Ignore other characters	Controller Card	3-5
MDH16 MCPC-20 Ignore other characters	Controller Card	3-5
MDH16 MCPC-40 Ignore other characters	Adapter Card Controller Card	3-5
MDH16 MCPC-80 Ignore other characters	Adapter Card Controller Card	3-5
MDH31 DISK I/O ERROR	Exchange Diskette Interface Card Controller Card	3-5
MDH31 K/D I/O ERROR PRESS ANY FUNCTION KEY TO CLEAR	Keyboard/Display Unit Adapter Card	3-25 3-5
MDH70L	Adapter Card Head/Carriage Asm Diskette Control Card Controller Card	3-5 3-43 3-41 3-5
MDH70U	Adapter Card Head/Carriage Asm Diskette Control Card Controller Card Interface Card	3-5 3-43 3-41 3-5
MDD71L	Exchange Diskette Head/Carriage Asm	3-43
MDD71U	Exchange Diskette Head/Carriage Asm	3-43
MDD71X	Exchange Diskette Head/Carriage Asm	3-43

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On Line Error Symptoms (continued)

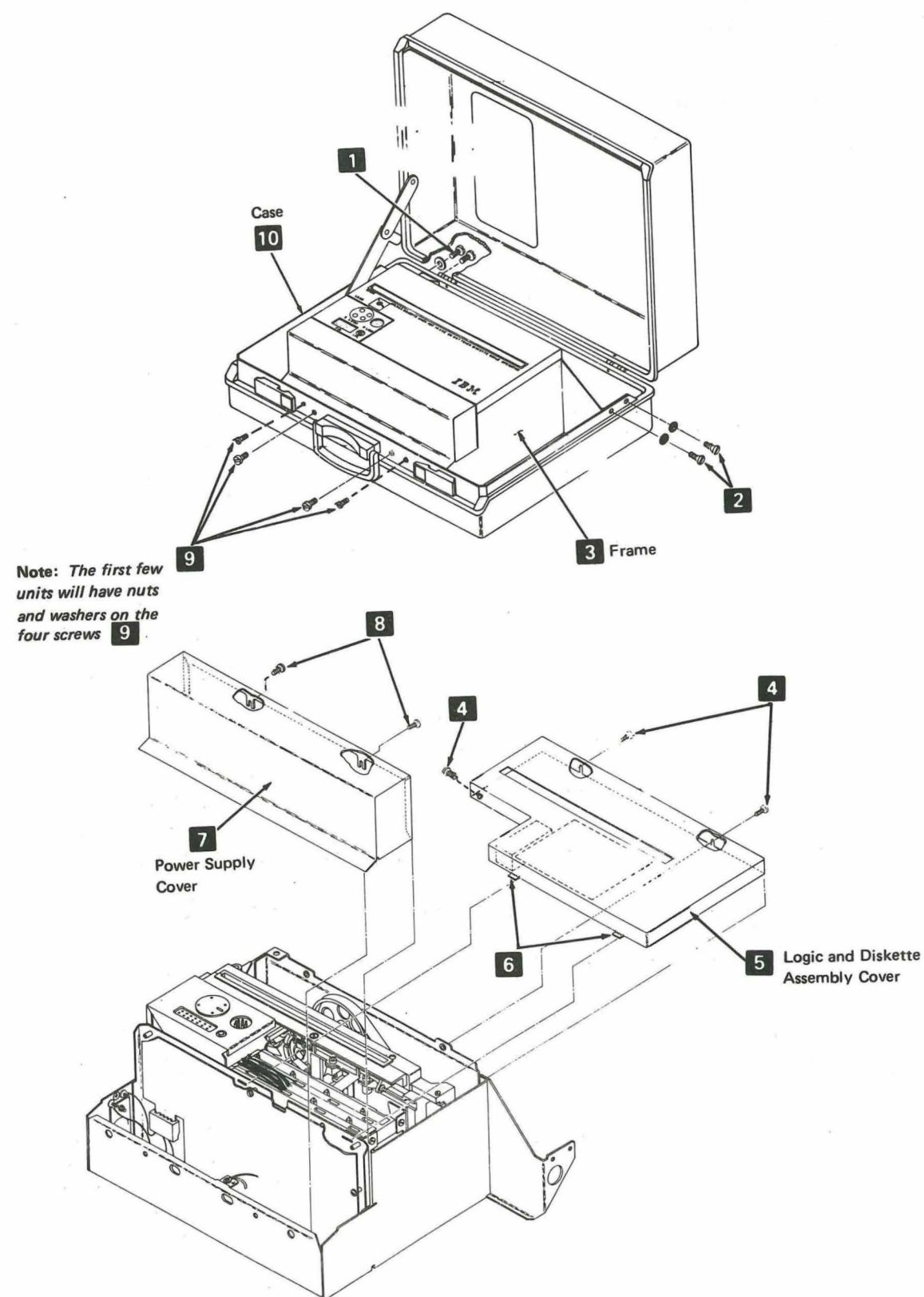
Error Symptoms	FRU/Procedure List	Go To
MDH72L	Keyboard/Display Unit Adapter Card	3-25 3-5
MDH72U	Keyboard/Display Unit Adapter Card	3-25 3-5
MDH73L	Adapter Card Interface Card DTE/DCE Cable Asm	3-5 3-17
MDH73X	Adapter Card	3-5
MDH74L	Adapter Card Common Interface Cable	3-5 3-18
MDH74X	Adapter Card	3-5
MDH75L	Adapter Card Interface Card R-Loop Cable Asm	3-5 3-23
MDH75X	Adapter Card	3-5
MDH76L	Adapter Card Interface Card S-Loop Cable Asm	3-5 3-23
MDH76X	Adapter Card	3-5
IPL LOADER	Exchange Diskette Controller Card	3-5

Chapter 3. Maintenance Information

This chapter contains service checks, removal and replacement procedures, wiring diagrams, and other reference information required to repair the MD-2.

Service checks precede the removal and replacement procedures. In most instances the supporting art for the service checks, removals, and replacements is on the page facing (even-numbered page) the procedure.

Frame and Covers



Frame Removal

Note: The MD-2 can be serviced without removing the frame from the case.

1. Open the case 10 and remove the eight screws 1, 2, and 9.
2. Remove the keyboard/display, cables, and accessories from the case and place them beside the case.
3. Lift the frame 3 out of the case.

Frame Replacement

Reverse the removal procedure.

Top Cover Removal

1. Ensure that a diskette is not in the MD-2.
2. Loosen the three holding screws 4.
3. Lift the rear of the cover 5 and slide the cover back to free the two tabs 6.

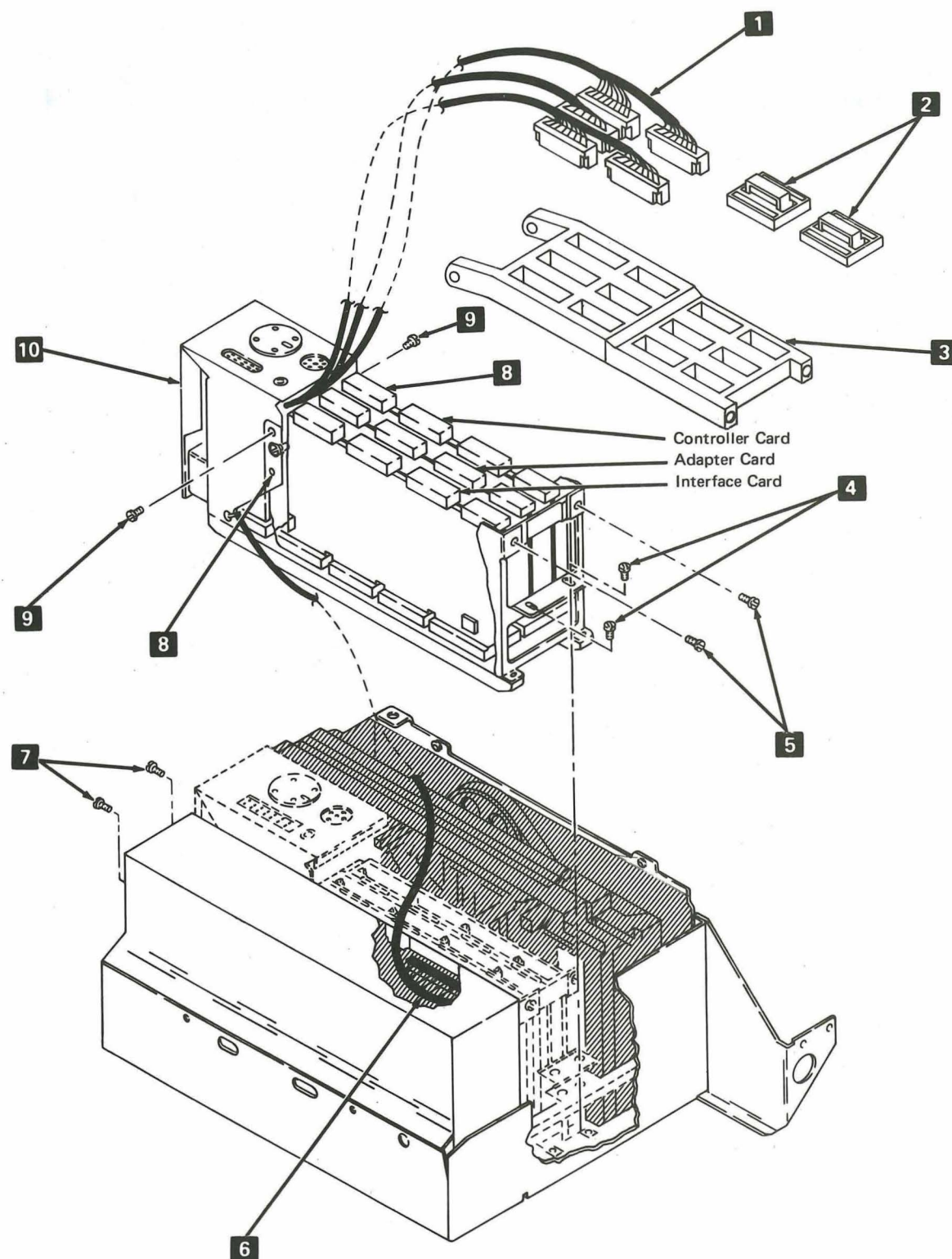
Power Supply Cover Removal

1. Loosen the two screws 8.
2. Lift the cover to remove.

Cover Replacement

Reverse the removal procedure.

Logic Assembly and Logic Cards



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Logic Assembly Removal

When the MD-2 is to be operated with power on after removing the logic assembly from the frame, do not disconnect any of the cables in the following procedure. After removing the logic assembly from the frame, place it in the service position across the power supply.

1. Disconnect ac power to the MD-2.
 2. Remove the top cover (see page 3-3).
 3. Remove the diskette drive from the MD-2 frame and place it in the service position (see page 3-29). This makes removing the logic assembly easier.
 4. Remove the two screws **4**.
 5. Loosen the two screws **7**.
 6. Lift the logic assembly **10** out of the frame being careful not to damage the cables.
- Note:** Stop here if you do not need to isolate the logic assembly from the unit.
7. Remove the power supply cover (see page 3-3).
 8. Disconnect the dc distribution cable **6** from the power supply.
 9. Disconnect the logic assembly ground wire from the frame.
 10. Loosen the screw **8** and remove the cable retainer holding the diskette control cable in the logic board.
 11. Disconnect the diskette drive control cable from the logic board position C2 (see page 3-6).
 12. Disconnect the diskette drive motor cable (B/P4) from the diskette drive (see page 3-28).
 13. Disconnect the diskette drive zero stop card voltage connector (CD8) from the Zero Stop card (see page 3-28).

Logic Assembly Replacement

Reverse the removal procedure. Ensure that the ground wire between the logic assembly and the frame is reconnected.

Logic Card Removal

1. Disconnect ac power to the MD-2.
2. Remove the top cover (see page 3-3).
3. Remove the diskette drive from the MD-2 frame and place it in the service position (see page 3-29). This makes removing the logic assembly easier.
4. Remove the two top card crossovers **2**.
5. Disconnect the five top card connectors **1**.
6. Remove the two screws **4**.
7. Loosen the two screws **7**.
8. Lift the logic assembly out of the frame. Be careful not to damage the cables.
9. Loosen the two screws **8** and remove the two cable retainers.
10. Remove the two card-retainer holding screws **5**.
11. Remove the two card-retainer holding screws **9**.
12. Lift the card retainer **3** away from the logic assembly.
13. Remove the appropriate logic card by lifting one end to unseat the card.

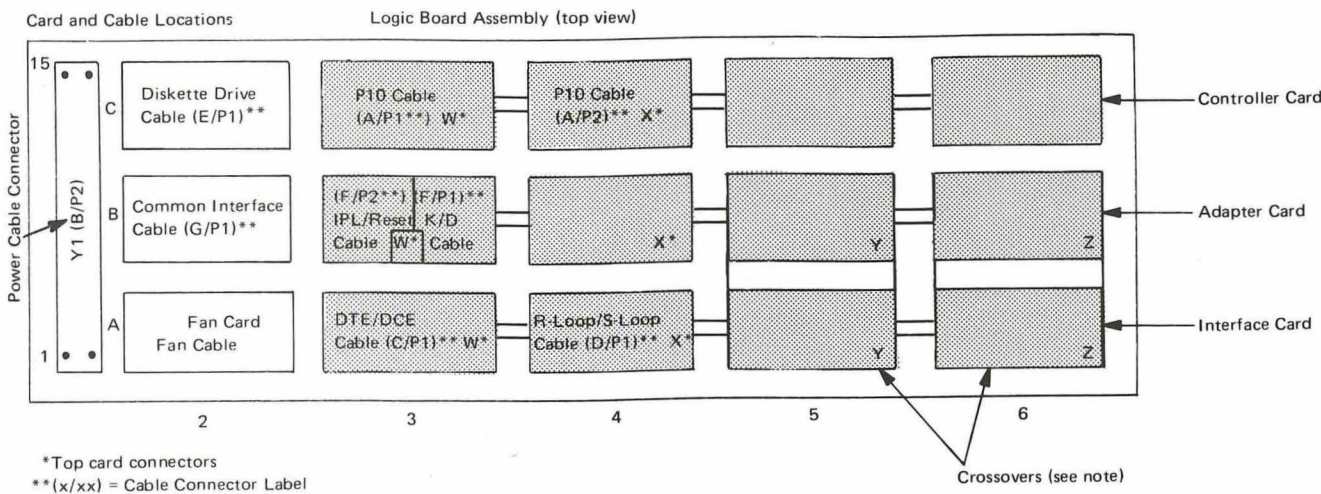
Logic Card Replacement

Reverse the removal procedure and check that:

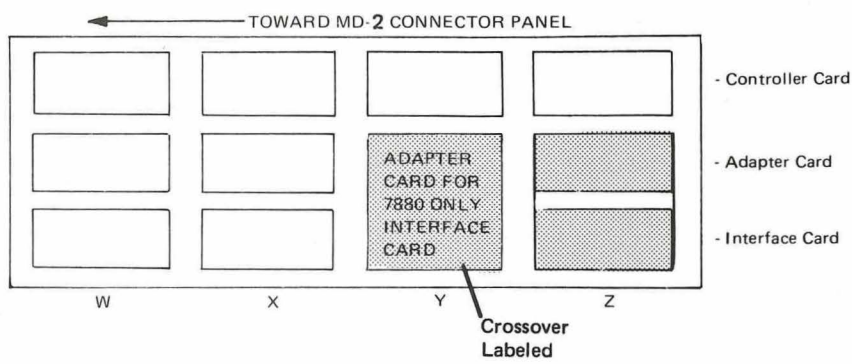
1. All cards are seated.
2. All connectors are seated.
3. Ensure that the cables between the logic assembly and the diskette drive are not pinched under the logic unit.

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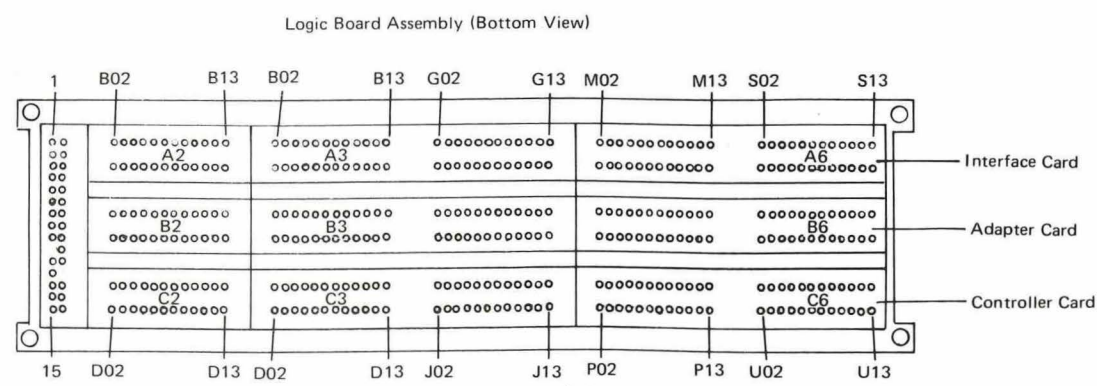
Logic Card and Cable Connector Locations



Note: The crossover in the "Y" position on MDs used with 7880 Controllers is label ed "FOR 7880 ONLY" and must be installed as shown in the illustration below. The MD logic cover is also label ed "FOR USE WITH 7880 ONLY".

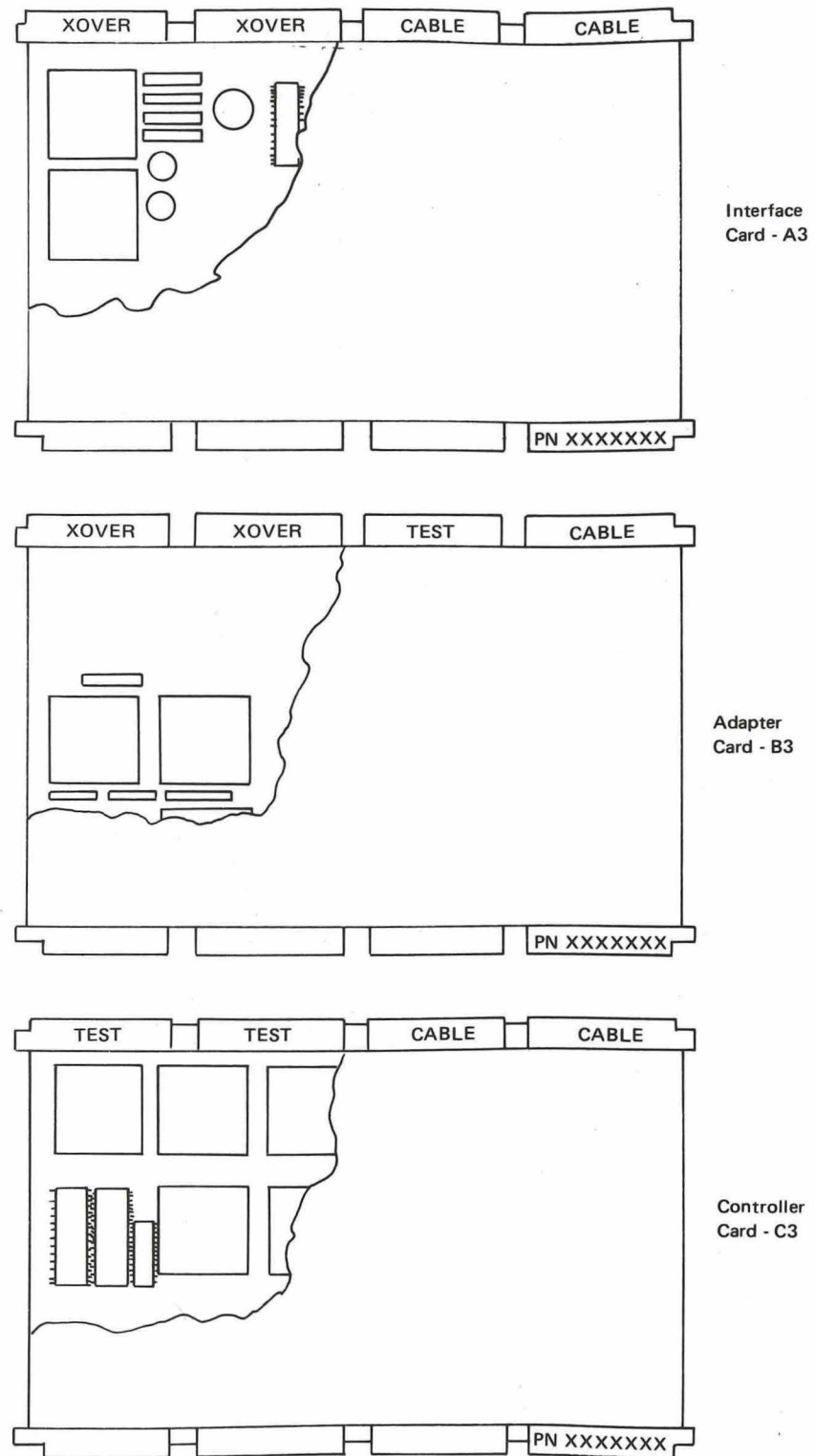


Logic Board Pin Numbering



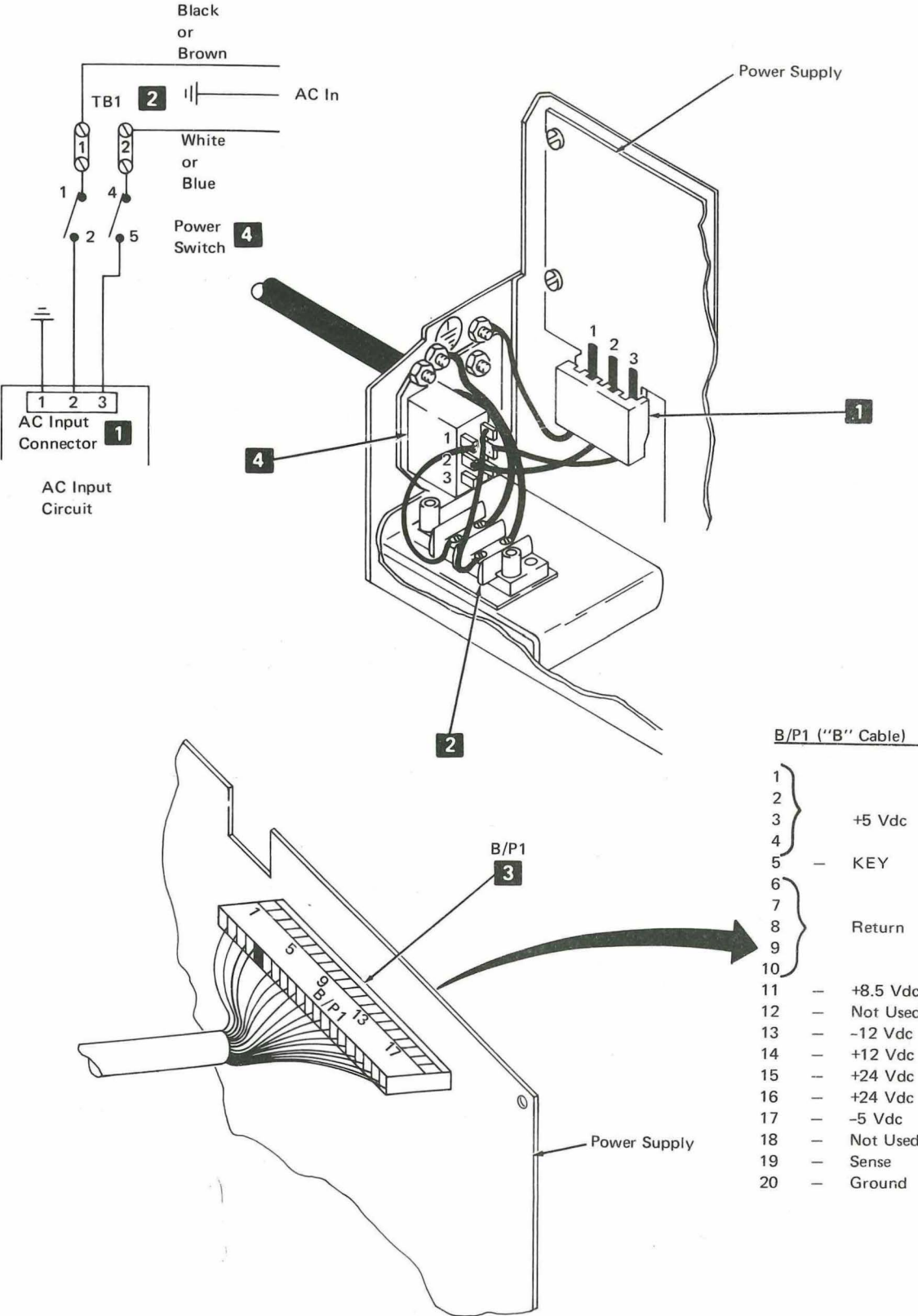
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Previous EC: None
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Logic Card Identification



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Power



Power Supply Service Check

The MD-2 power supply is a switching-type power supply that requires a load connected before it powers on. No adjustment or fuse replacement is permitted with this power supply. If the fan and diskette drive motors are operating, this is a quick indication that the power supply has powered on. Always use a voltmeter to verify that the voltages are correct. If an overload causes the power supply to power off, turn the MD-2 power switch to OFF for at least 3 seconds to permit the power supply to reset. Exchange the power supply anytime the output voltages are incorrect.

1. Measure the ac input voltage at the ac input connector 1. The measured ac voltage should correspond within $\pm 10\%$ to the line voltage.
2. If the ac voltage is not correct, verify the ac input circuit connections at TB1 2, the power switch 4, and the ac input voltage at TB1 2.
3. Measure dc voltages at the dc output connector (B/P1) 3. Do not disconnect the cable from the power supply when measuring these voltages.

Note If the ac input voltage is correct but the dc voltages are not correct, inspect the dc distribution cable and the pins on the bottom of the logic board for a short circuit. If a short circuit is not visible, exchange the power supply (see page 3-11).

Sense Voltage Service Check

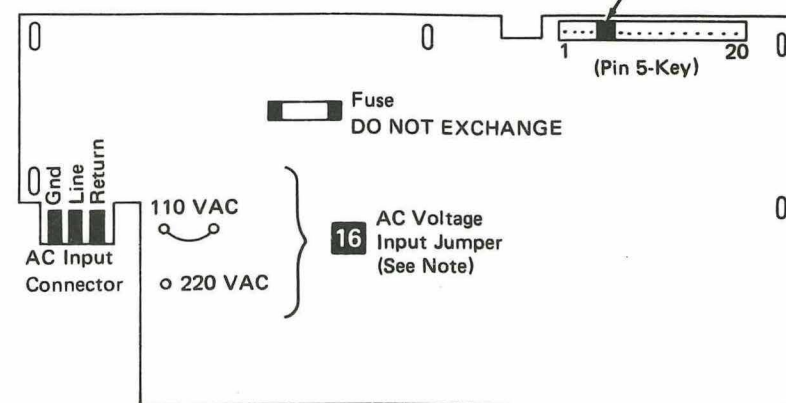
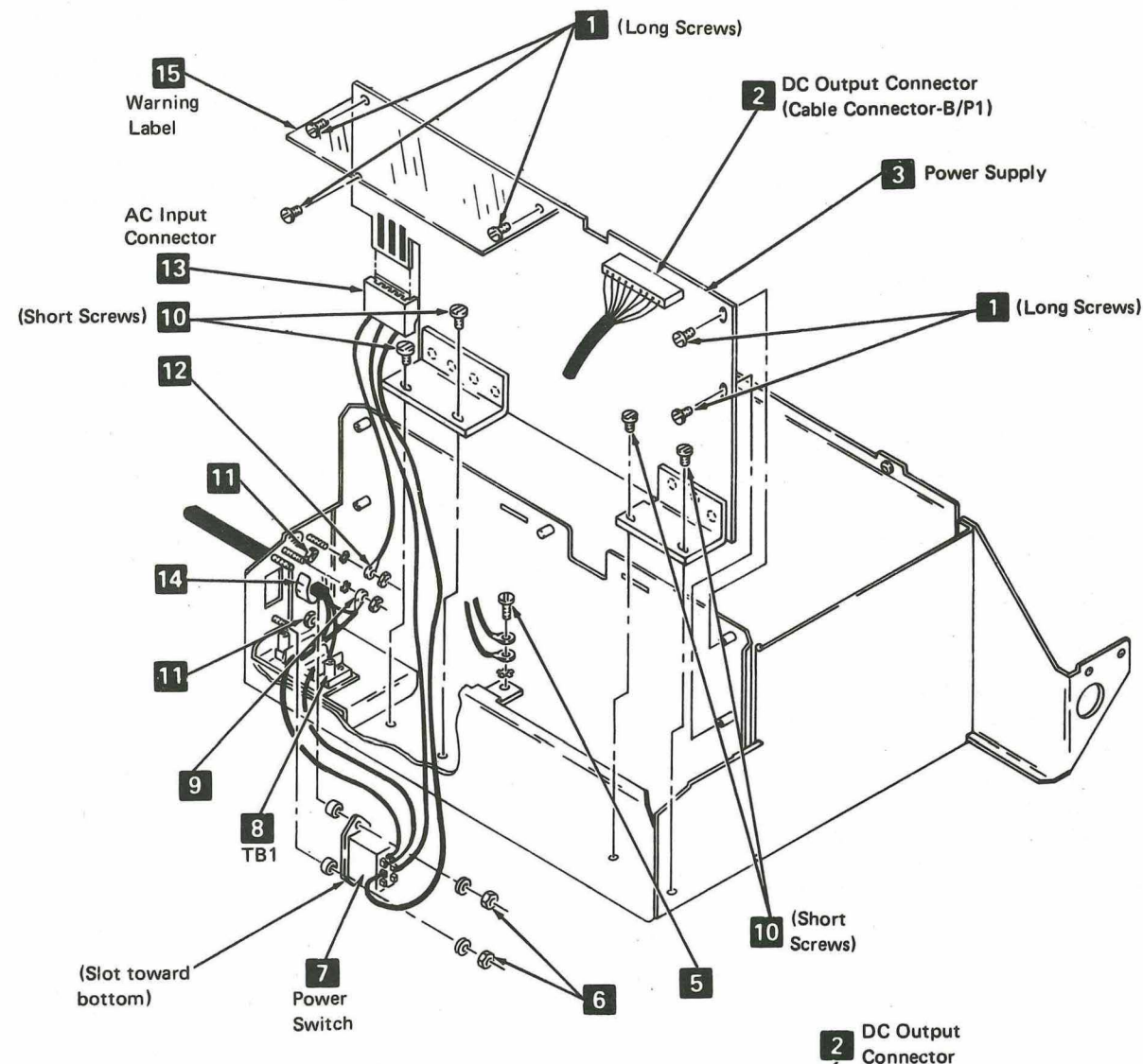
The sense voltage output (pin 19 on the dc output connector) goes to +5 vdc whenever the ac input voltage is less than 90 vac. If the sense output remains at +5 Vdc ± 1 volt, ROS error symptom 50 53 54 58 5B 5C will be displayed.

Bypass the power supply by shorting pin 19 to 20 on the dc output connector (B/P1). If the error symptom disappears, exchange the power supply (see page 3-11).

If the error does not disappear, short pin 20 to pin 7 on the dc output connector (B/P1) 3. If the error to disappears, the ground input to pin 20 is open.

Turn power off and verify the continuity of the "B" cable ground (see page 3-12).

Power (Continued)



3 Power Supply (Front View)

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Note: All replacement power supplies are shipped jumpered for 220 Vac input.

Power Supply

Removal

1. Disconnect ac power from the MD-2.
2. Remove the top cover and the power supply cover (see page 3-3).
3. Remove the warning label holder assembly 15.
4. Disconnect the dc output connector 2.
5. Remove the ground wire screw 5.
6. Remove the four lower (short) mounting screws 10.
7. Remove the five upper (long) holding screws 1.
8. Lift the power supply 3 out of the frame.
9. Disconnect the ac input connector 13.

Replacement

1. Reverse the removal procedure and ensure that the ac input voltage jumper 16 is on the correct pin.
2. Ensure that the warning label holder is installed.
3. Do not interchange the long screws 1 with the short screws 10.

Warning: All replacement power supplies are shipped jumpered for 220 Vac input. The power supply will be damaged if connected to 220 Vac with the voltage selection jumper in the 110 Vac position.

Power Switch Assembly

Removal

1. Disconnect ac power to the MD-2.
2. Remove the top cover and the power supply cover (see page 3-3).
3. Remove the power supply using the procedure on this page.
4. Remove the safety shield from TB1 8.
5. Disconnect the wires from TB1-1 and TB1-2 (wires from the power switch).
6. Remove the ground wire 12 from the frame.
7. Remove the top switch holding nut 6 and loosen the bottom nut.
8. Remove the power switch assembly 7.

Replacement

Reverse the removal procedure.

AC Power Cable

Removal

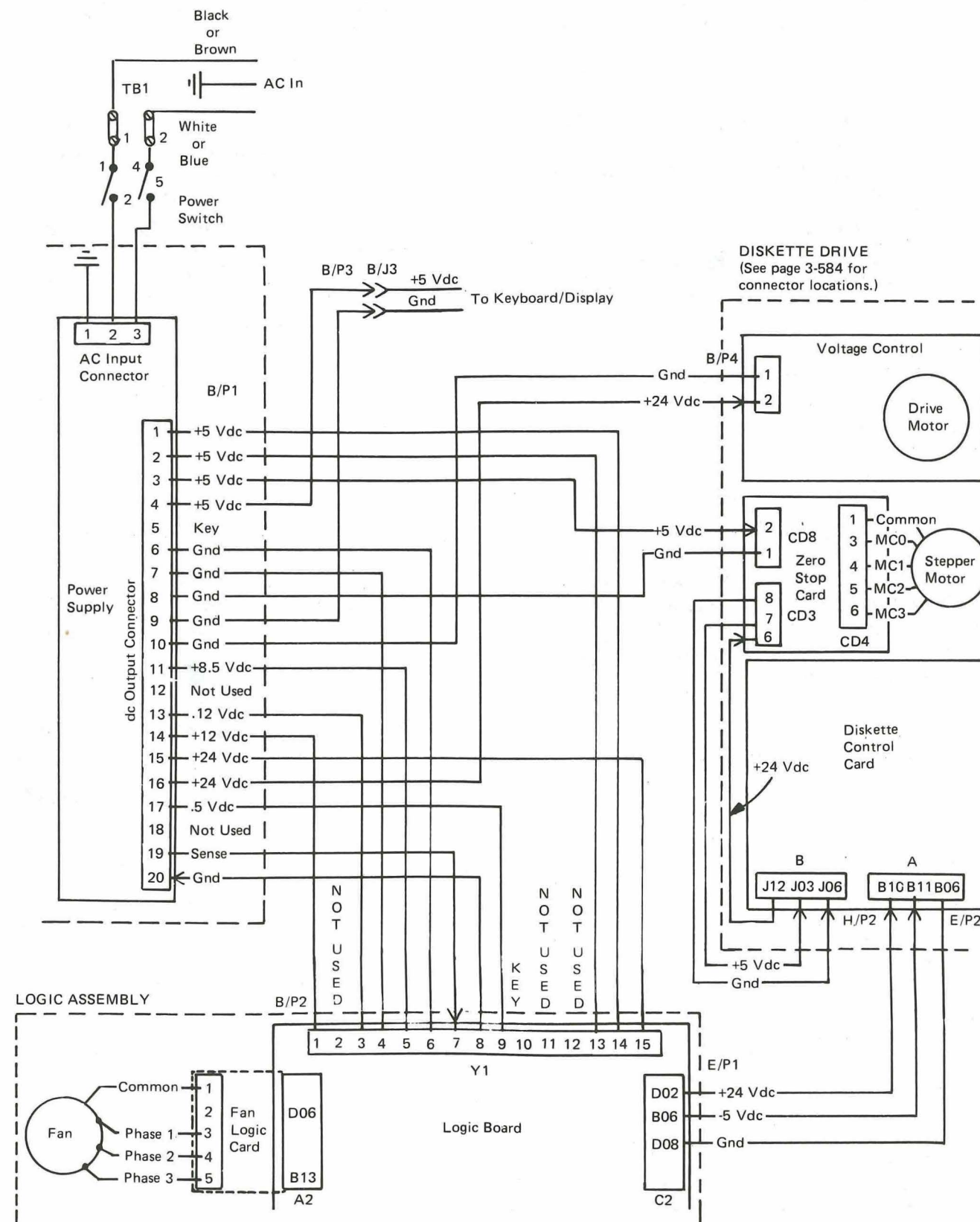
1. Disconnect ac power to the MD-2.
2. Remove the top cover and the power supply cover (see page 3-3).
3. Remove the power supply using the procedure on this page.
4. Disconnect the ac power cable ground wire 9.
5. Remove the two nuts 11.
6. Remove the safety shield from TB1 8.
7. Disconnect the ac power cable from TB1 at TB1-1 and -2 (see page 3-12 for the cable wire colors).
8. Remove the ac power cable strain relief 14 and remove the ac power cable.

Replacement

Reverse the removal procedure.

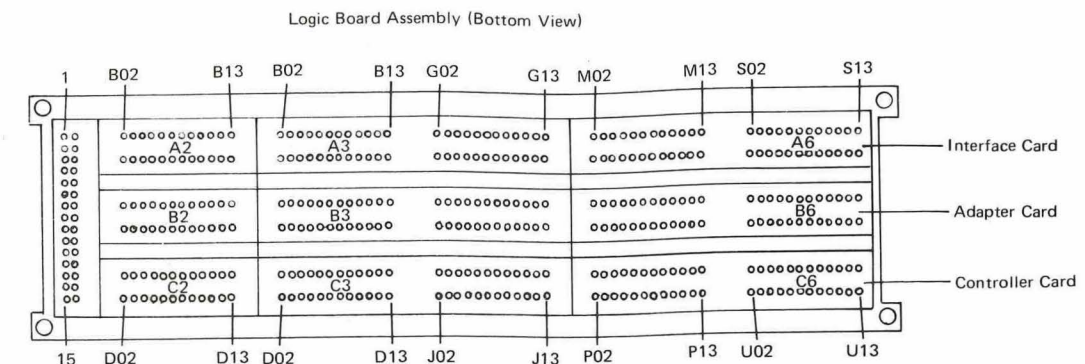
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Voltage Distribution Diagram



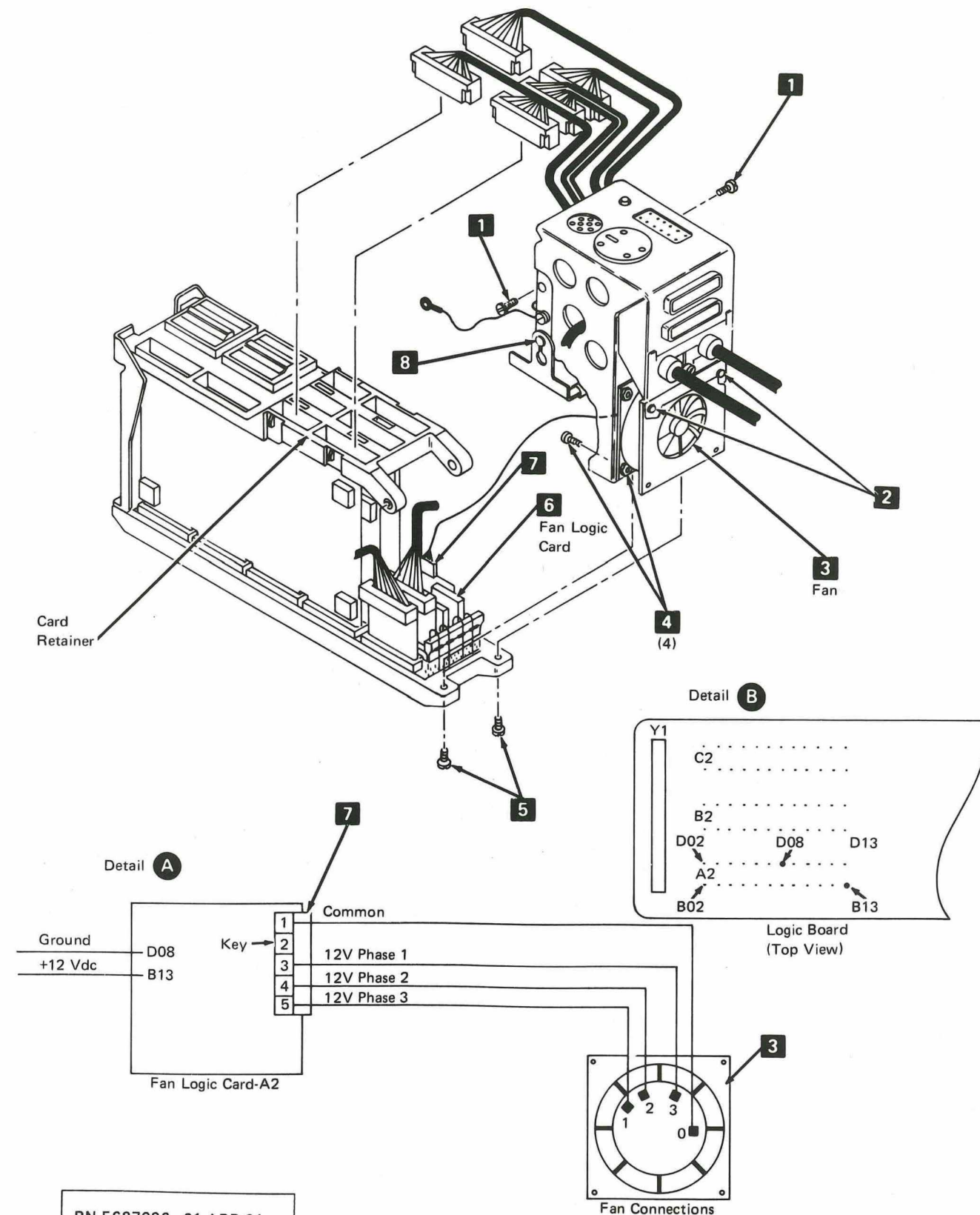
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Present EC: 344569
Previous EC: None
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Logic Board Voltage Distribution



Logic Card	Voltage	Pins
Fan Logic (A2)	+12 Gnd	B13 D08
Disk Adapter (C2)	-5 +24 Gnd	B06 D02 D08
Interface (A3)	+5 -5 +8.5 +12 -12 Gnd	D03 J03 P03 U03 B06 G06 M06 S06 B11 G11 M11 S11 B13 M13 G13 S13 D08 J08 P08 U08
Adapter (B3)	+5 -5 +8.5 Gnd	D03 J03 P03 U03 B06 G06 M06 S06 B11 G11 M11 S11 D08 J08 P08 U08
Controller (C3)	+5 -5 +8.5 Gnd	D03 J03 P03 U03 B06 G06 M06 S06 B11 G11 M11 S11 D08 J08 P08 U08

Fan Assembly



Fan and Fan Logic Card

The fan is operated by 12-volt, 3-phase, pulsing dc voltage. This voltage is created by the fan logic card (6) in logic board location A2. The power source for the logic card is +12 Vdc from the power supply (see Detail A). Using a CE meter, measure between common and each of the three phases (see Detail A). The meter should read approximately 9 Vac on each phase.

The fan may run slowly with one phase missing. This can cause the logic assembly to become too hot to operate properly.

The fan will run backward when any two of the phases are reversed. Air flow is toward the logic cards when the fan is correctly wired.

Fan Motor Resistance Check

1. Remove the logic assembly from the frame (see page 3-5).
2. Loosen the screw (8) on the fan logic card side of the connector panel and remove the cable retainer.
3. Disconnect the fan connector (7) on the Fan Logic card A2 (6).
4. Measure the resistance between common (pin 1 on the connector) and the three phases (pins 3, 4, and 5 on the connector). See Detail A. The resistance should be between 16 and 24 ohms.
5. Measure the resistance between the three phases (pins 3 to 4, 3 to 5, and 4 to 5 on the connector). See Detail A. Each of these measurements should be between 32 and 48 ohms.

Fan

Removal

1. Remove the logic assembly from the frame (see page 3-5).
2. Loosen the two screws (8) (one on each side of the connector panel) and remove only the cable retainer holding the fan logic card.
3. Remove the two card-retainer holding screws (1).

4. Remove the two lower connector panel holding screws (5).
5. Disconnect the fan connector (7) from the fan logic card A2 (6).
6. Remove the four fan mounting screws (4).
7. Remove the fan (3).

Replacement

Reverse the removal procedure.

Fan Logic Card

Service Check

1. Loosen screw (8) on the fan logic card side of the connector panel and remove the cable retainer that holds the fan logic card in place.
2. Remove the fan logic card (6) from logic board position A2.
3. Measure for +12 Vdc ($\pm 10\%$) between pins A2B13 and A2D08 on the logic board (see Detail B).
4. Reinstall the fan logic card in logic board position A2 if the voltage is correct.
5. Measure the output of the fan logic card (see page 3-14, Detail A) for 9 to 12 Vac between the common lead and each of the three phases.
6. If the input voltage to the fan logic card is correct and the fan resistance check is correct but the output from the fan logic card to the fan is not correct, exchange the fan logic card.

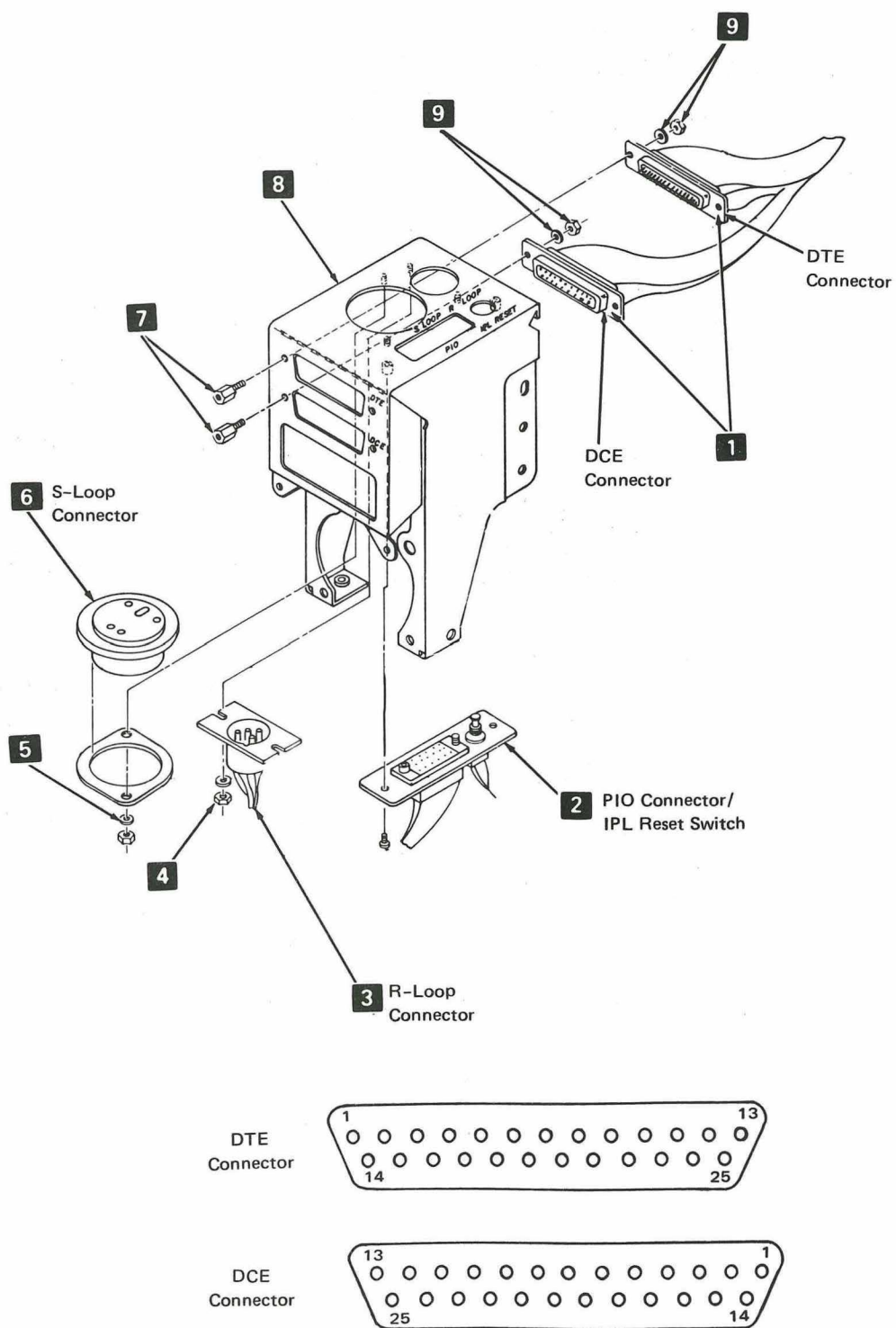
Removal

1. Remove the logic assembly from the frame (see page 3-5).
2. Loosen the screw (8) and remove the cable retainer holding the fan logic card.
3. Remove the fan logic card (6) from board location A2.
4. Disconnect the fan connector (7) from the fan logic card A2 (6).

Replacement

Reverse the removal procedure.

DTE and DCE Cables and Connectors



Removal

1. Remove the logic assembly from the frame (see page 3-5).

Note: In addition to the following steps, you may find it easier to remove the DTE and DCE connectors and cable assembly by first removing the fan assembly (see page 3-15) and pulling the keyboard/display and common interface cables and strain relief away from the connector panel (see page 3-19, step 13) until the K/D and common interface cable-bonding clamp no longer obstructs access to the PIO connector mounting screw.

2. Disconnect all cables between the connector panel 8 and the logic assembly so that the connector panel is completely free from the logic assembly. This makes the remainder of the DTE/DCE connector removal procedure easier.

3. Perform the PIO connector and IPL Reset Switch Assembly 2 removal procedure (see page 3-21).
4. Remove the R-Loop and S-Loop connector mounting nuts 4 and 5 and remove the R-Loop 3 and S-Loop 6 connectors from the connector panel.
5. Remove the four DTE/DCE connector mounting studs 7 and nuts 9.
6. Remove the DTE and DCE connectors 1 and cable assembly from the connector panel.

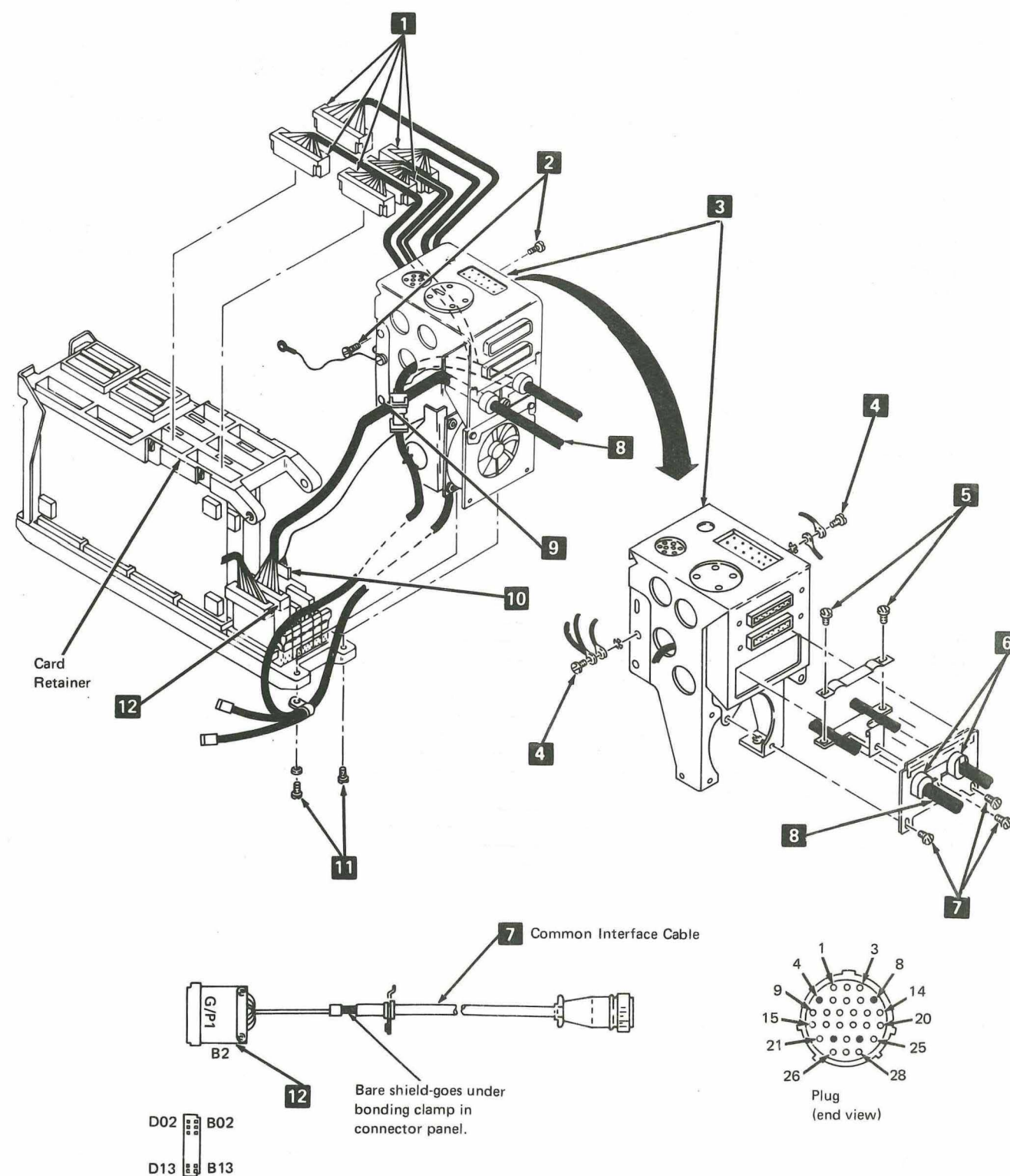
Replacement

Reverse the removal procedure ensuring that the top connectors are reconnected correctly.

DTE/DCE Cable Wiring

A3-W C/P1	DCE C/J1	DTE C/J2	
D02	+Receive Clock	24	17
D03	+Transmit Clock	15	23
D05	+Rec Line Sig Det	8	4
D06	+Speed Select	5	11
D07	+DTR	20	6
D08	DC Return	7	7
D10	+Tsm Data	3	2
B02	+New Sync	22	14
B05	+Ring	23	22
B06	+RTS	4	8
B07	-Rec Data	2	3
B09	+DSR	6	20
B10	+Rec Clock	17	
D04	+Transmit Clock		15
D09	+Test		18
B04	+RFS		5
Frame Gnd			1
D11			
D12			

Common Interface Cable



Removal

1. Disconnect ac power to the MD-2.
2. Remove the top cover (see page 3-3).
3. Remove the logic assembly from the frame (see page 3-5).
4. Remove the card-retainer mounting screws **2**.
5. Loosen the two cable retainer holding screws **9** (one on each side of the connector panel).
6. Disconnect all top card connectors **1** from the logic cards.
7. Remove the two lower connector-panel mounting screws **11**.
8. Remove screw **4** and remove the ground wire from the common interface cable.
9. Move the connector panel **3** away from the

logic assembly to allow space to remove the common interface cable **8**.

10. Disconnect the fan connector **10** from the fan logic card.
11. Disconnect the common interface cable connector G/P1 **12** from logic board location B2.
12. Remove the three strain-relief holding screws **7**.
13. Remove the two bonding clamp screws **5**.
14. Remove the common interface and K/D cable grommets **6** and remove the common interface cable **8** from the connector panel.

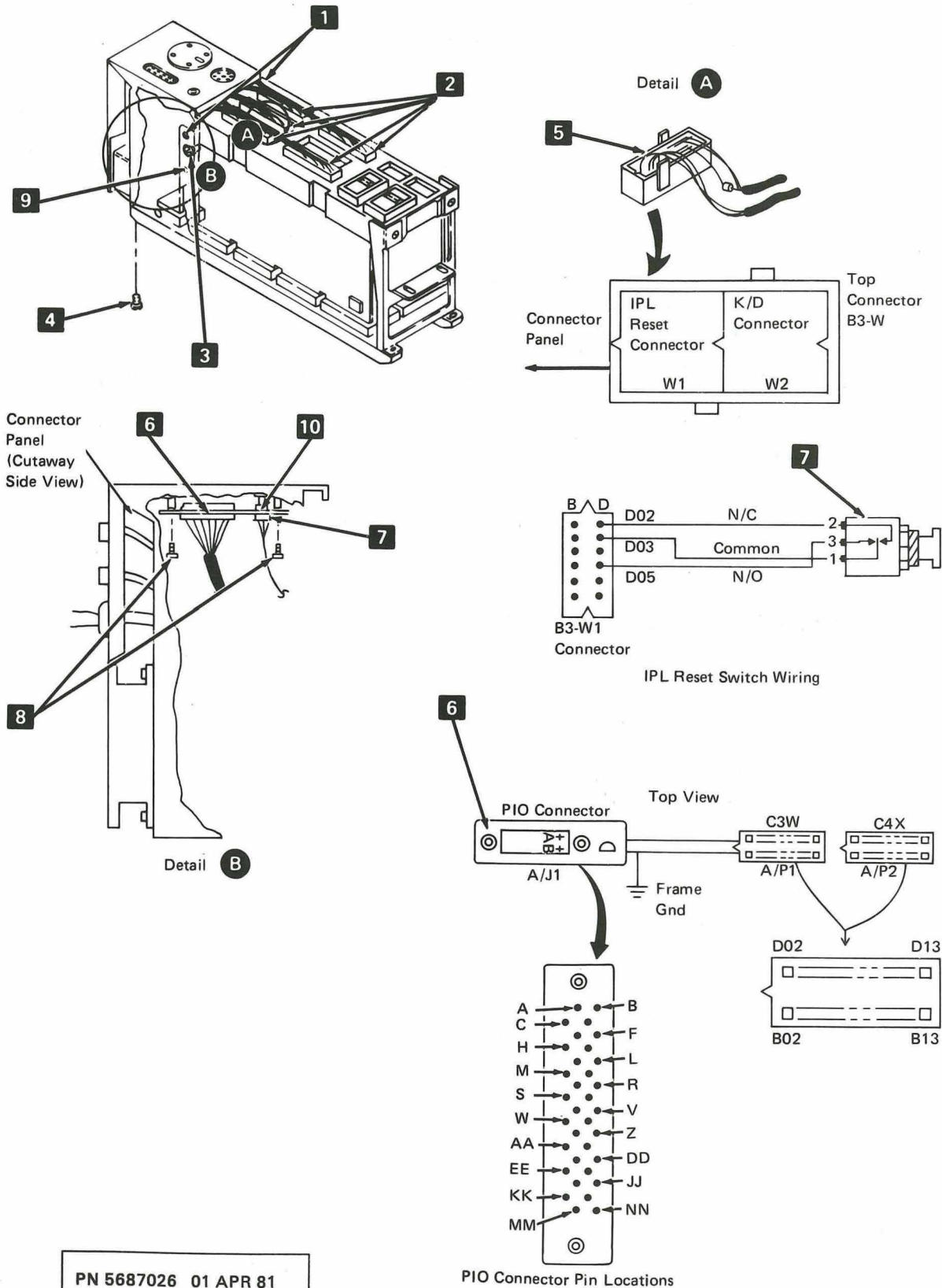
Replacement

Reverse the removal procedure.

Common Interface Cable Wiring

Logic Board Connector B2	Cable Connector
B12 — R-Loop/S-Loop Send	1
D11 — R-Loop/S-Loop Send	2
D08 —	11
B11 — R-Loop/S-Loop Rec	17
D12 — R-Loop/S-Loop Rec	18
B10 — Relay 1 Pick (R-Loop)	3
B06 — MD Sense	6
D10 — Relay 2 Pick (R-Loop)	23
D13 —	12
B08 — Enable	5
B07 — Status In	9
D09 — Shift	7
B09 — Data In	14
D06 — Write	13
	15
D05 — Read	16
D02 — Status Out	21
	19
D04 — Data Out	20
	25
Outer Shield — Frame Gnd	26
	27
	28

PIO Connector and IPL RESET Switch Assembly



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The PIO connector, IPL RESET switch, mounting bracket, cable, and cable connectors are removed as one assembly. The IPL RESET switch can then be removed from the mounting bracket for replacement. The PIO connector, cable, and mounting bracket are one assembly.

Removal

1. Remove the logic assembly from the frame (See page 3-5). Position it across the power supply and the diskette drive.
2. Disconnect all top card connectors (2) from the logic cards.
3. Loosen the two screws (9) (one on each side of the connector panel) and remove the cable retainers.
4. Remove the two card-retainer holding screws (1).
5. Remove the two lower connector-panel holding screws (4).
6. Disconnect the ground wire (3).
7. Remove the two mounting bracket screws (8) and remove the mounting bracket assembly (6).
8. If you are replacing only the IPL RESET switch and cable assembly, remove the latching assembly (5) from the cable connectors. The connector at B3-W is in two parts; one part is for the IPL RESET switch, and the other part is for the K/D (see Detail A).
9. Remove the switch mounting nut (10) and separate the IPL RESET switch and cable assembly (7) from the PIO connector and mounting bracket assembly (6).

Replacement

Reverse the removal procedure.

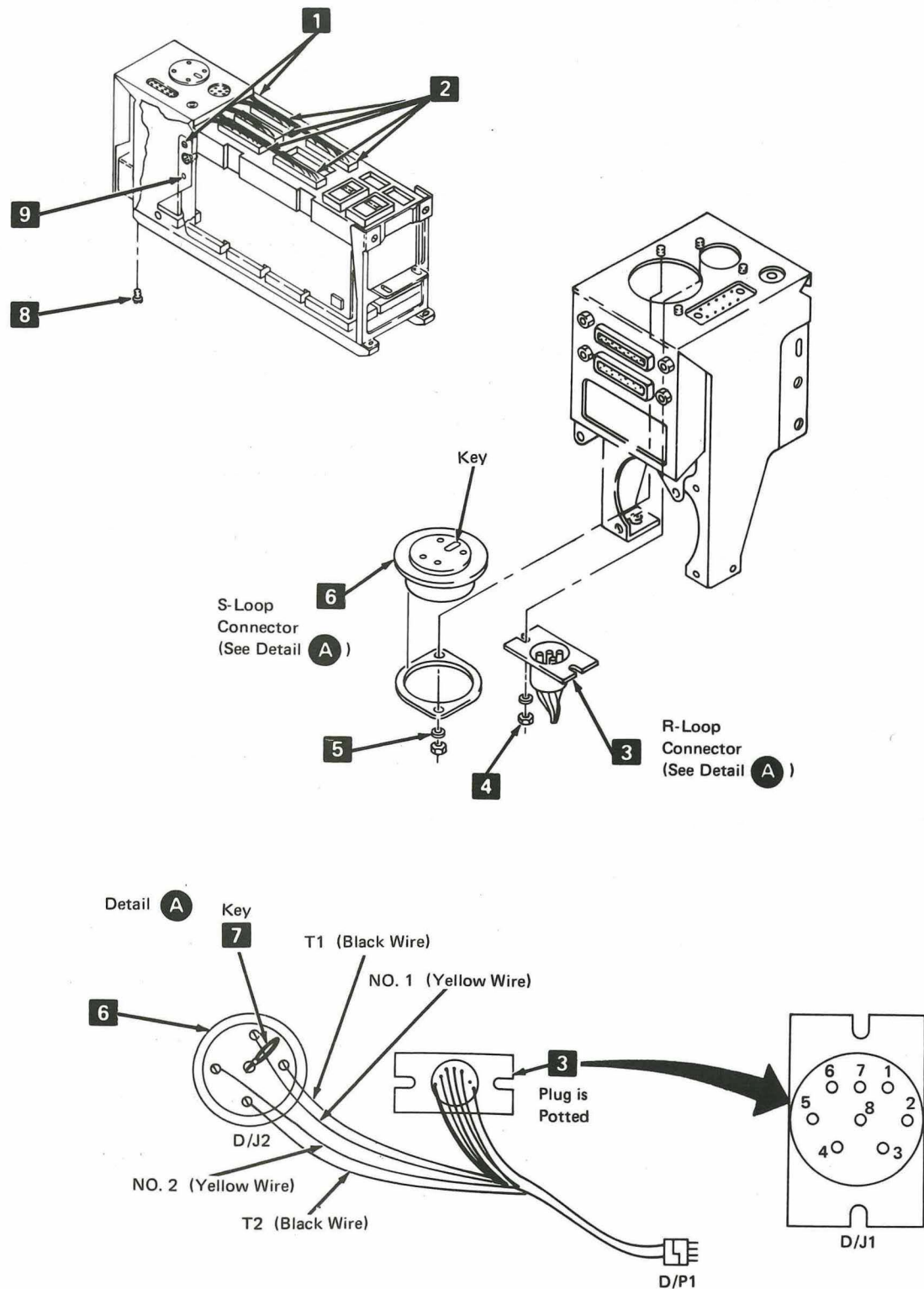
PIO Connector and Reset Switch Cable Wiring

Conn A/J1	Signal Name	Conn A/P1	Conn A/P2
A	-UC Bus 0 (In)		B11
J	-UC Bus 1 (In)		B06
D	-UC Bus 2 (In)		B08
F	-UC Bus 3 (In)		B05
L	-UC Bus 4 (In)		B04
T	-UC Bus 5 (In)		B09
DD	-UC Bus 6 (In)		B03
N	-UC Bus 7 (In)		B10
B	-UC Bus P (In)		B07
E	-VB		B12
C	-PV		B13
CC	-UC Bus 0 (Out)		D09
JJ	-UC Bus 1 (Out)	B12	
EE	-UC Bus 2 (Out)		D07
KK	-UC Bus 3 (Out)		D06
HH	-UC Bus 4 (Out)		D05
MM	-UC Bus 5 (Out)		D04
X	-UC Bus 6 (Out)		D03
BB	-UC Bus 7 (Out)		D02
LL	-UC Bus P (Out)	B13	
FF	-WS TA Buff		B02
W	-WS TC Buff		D12
Y	-WS TD Buff		D11
H	-I/O Cntrl (Out)		D02
AA	-POR		D10
Z	-5 Vdc	B10	
R	+5 Vdc	B08	
U	DC Return	D07	
K,M,S	Shield Gnd		D08
NN	Frame Gnd	(Attaches to Cable Shield)	D13

- ☐ B03
- ☐ D03
- ☐ D11
- ☐ D09
- ☐ D10
- ☐ D12
- ☐ D13
- ☐ B07
- ☐ B11

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R Loop and S Loop Connectors and Cable



Removal

1. Remove the logic assembly from the frame (see page 3-5).
2. Loosen the screws **9** (one on each side of the connector panel) and remove the cable retainers.
3. Remove the card-retainer mounting screws **1**.
4. Remove the two lower connector panel mounting screws **8**.
5. Disconnect all cables between the connector panel and the logic assembly so that the connector panel is completely free from the logic assembly. This makes the remainder of the removal procedure easier.

Note: If you are replacing the R-Loop connector/cable assembly, it may be easier to remove the four wires from the S-Loop connector without removing the S-Loop connector from the connector panel.

6. Remove the R-loop and S-loop connectors mounting nuts **4** and **5** and remove the R-loop **3** and S-loop **6** connectors from the connector panel.
7. Remove the four wires from the rear of the S-loop connector. This separates the S-Loop connector FRU **6** from the R-loop connector and cable assembly FRU **3**. Exchange the failing FRU.

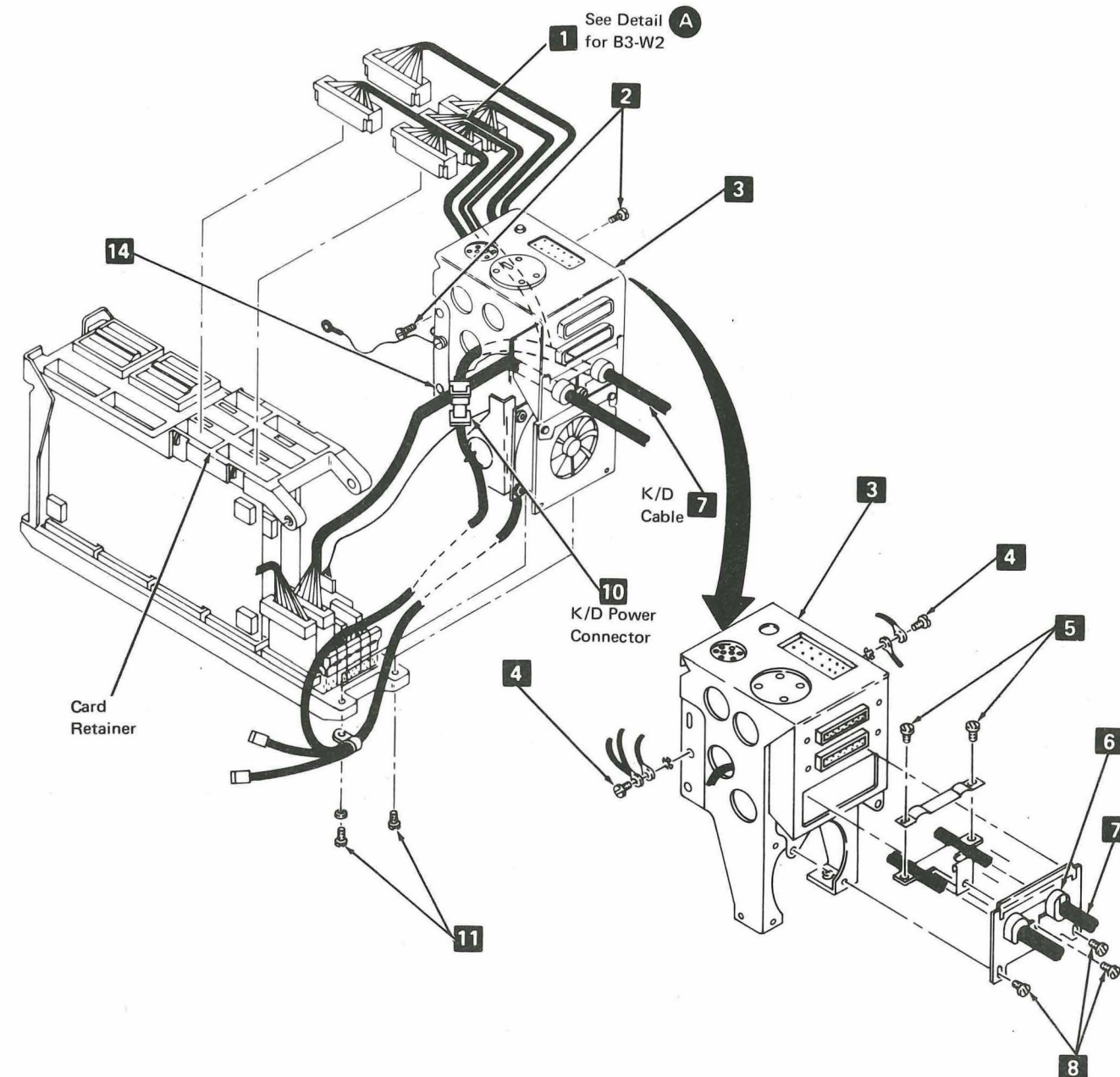
Replacement

Reverse the removal procedure using the key **7** on the S-loop connector as a reference for reconnecting the four S-loop wires.

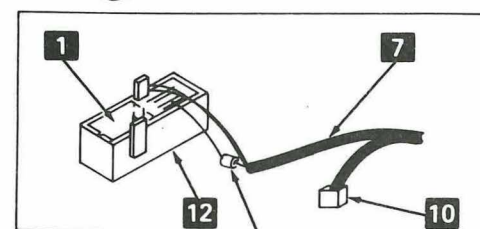
R-Loop and S-Loop Cable Wiring

D/P1 Conn	Signal Name	D/J1(R-Loop) Conn	D/J2(S-Loop) Conn
B06	-Rec		Yellow
D07	+Rec		Black
B07	-Tsm		Yellow
D08	+Tsm		Black
B04	-Tsm	2	
B02	+Tsm	3	
D04	-Rec	4	
D03	+Rec	5	
D05	Pick R1	6	
B05	Pick R2	7	
D02	Return	8	
	Frame Gnd	1	

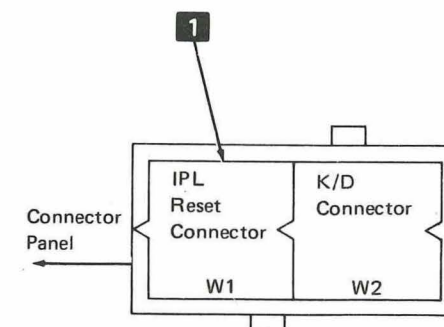
Keyboard/Display



Detail A



Ensure that this ferrite bead does not obstruct the replacement of the top cover.



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Normally, the K/D and the cable assembly are replaced when the K/D is defective. To replace the K/D, use the removal and replacement procedures on this page.

Disassembly of the K/D is not recommended; however, you may use the disassembling and assembling procedures for emergency repairs.

Service Check

This procedure uses a spare keyboard/display.

1. Remove the top cover (see page 3-3).
2. Disconnect top card connector B3-W **1**. Remove the shroud **12** from top card connector B3-W (see Detail A).
3. Remove the logic assembly from the frame (see page 3-5). Place it so power can be turned on.
4. Disconnect the K/D power connector **10**.
5. Connect the spare K/D as follows:
 - a. Connect the power connector **10**.
 - b. Install the shroud **12** on the two connectors from B3-W (see Detail A), and plug the connectors into top card position B3-W.
6. Power on the MD-2.
7. Do the IPL K/D tests.
8. If the failure symptom has not changed from the one directing you to do the K/D service check, exchange the adapter card at B3.
9. If the spare K/D is operating correctly, exchange the K/D.

Removal

1. Disconnect ac power to the MD-2.
2. Remove the top cover (see page 3-3).
3. Remove the logic assembly from the frame (see page 3-5).
4. Disconnect all top card connectors from the logic cards. Remove the shroud from B3-W **12** and separate the two parts of the connector (see Detail A).
5. Loosen the two cable retainer screws **14**.
6. Remove the two card-retainer mounting screws **2**.
7. Remove the two lower connector panel mounting screws **11**.
8. Remove the ground wires **4**.
9. Disconnect the K/D power connector **10**.
10. Move the connector panel **3** away from the logic assembly to allow space to remove the K/D cable **7**.
11. Remove the three strain relief holding screws **8**.
12. Remove the two bonding clamp screws **5**. Note the position of the cables under the bonding clamp.
13. Remove the K/D and common interface cable grommets **6** and remove the K/D cable **7** from the connector panel.

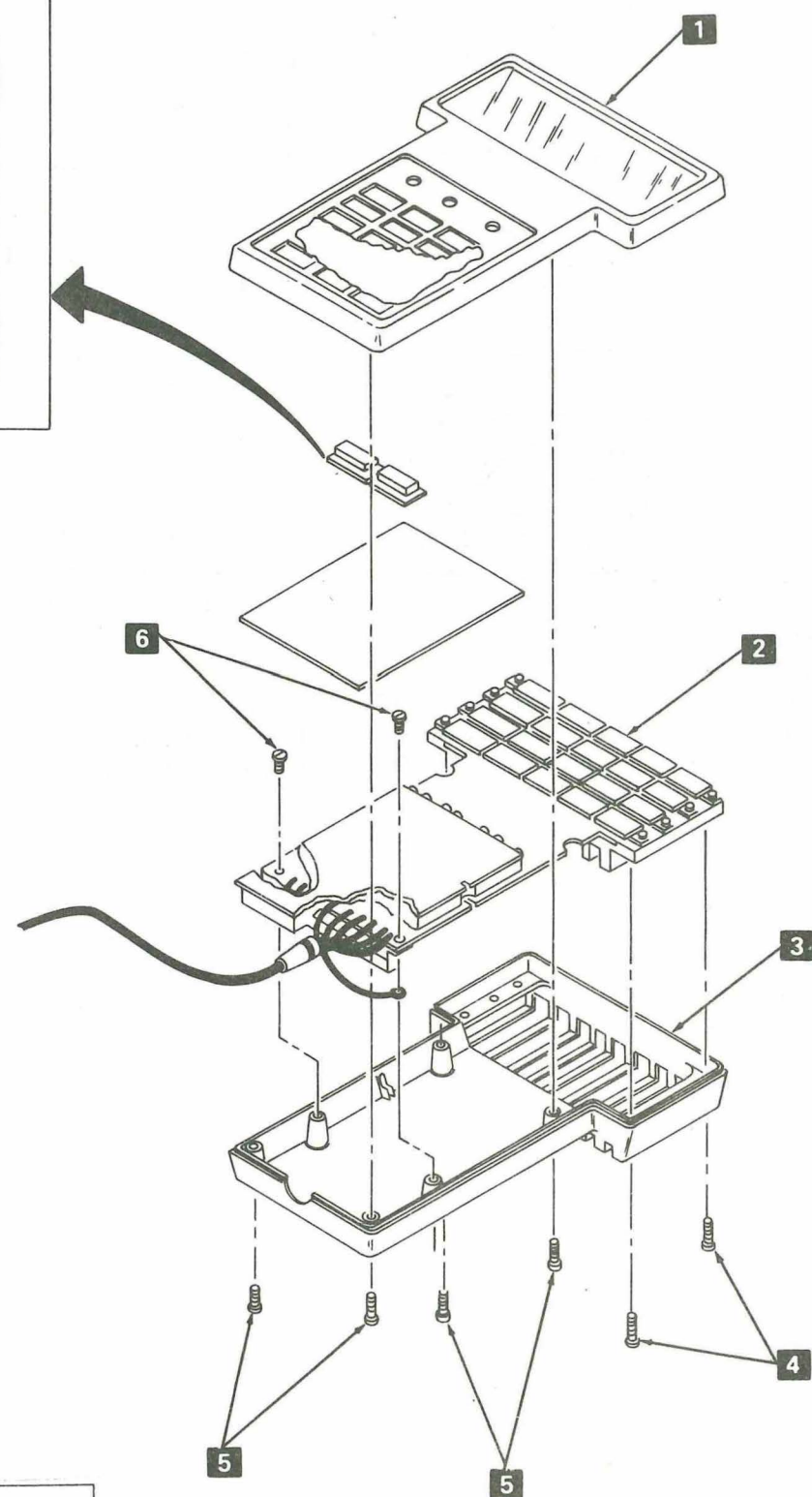
Replacement

Reverse the removal procedure.

Keyboard/Display (Continued)

1	2	3	4	5
6	7	8	9	0
A	B	C	D	E
F	G	H	I	J
K	L	M	N	O
P	Q	R	S	T
U	V	W	X	Y
Z				

Key Arrangement



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Disassembling

The keybuttons are held in place by the front case only. When the logic assembly **2** is removed from the front cover, the keybuttons will fall out if the cover is turned over.

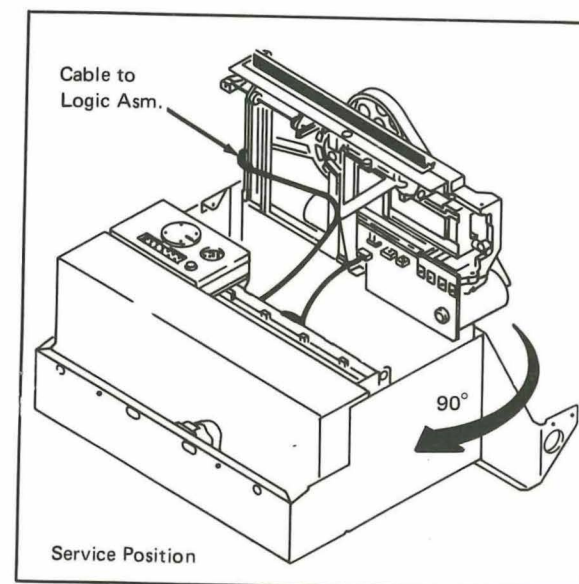
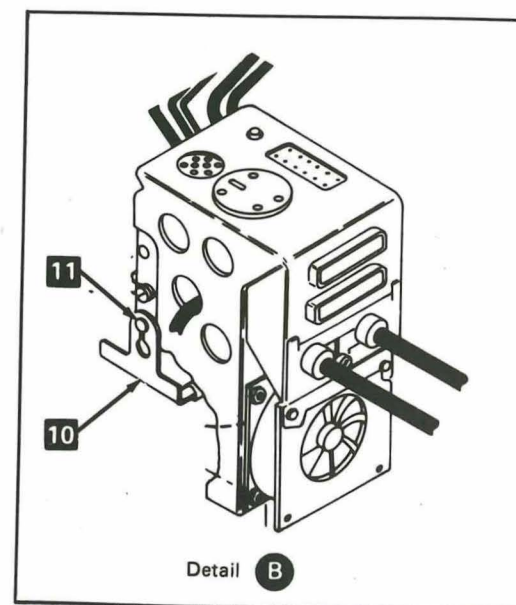
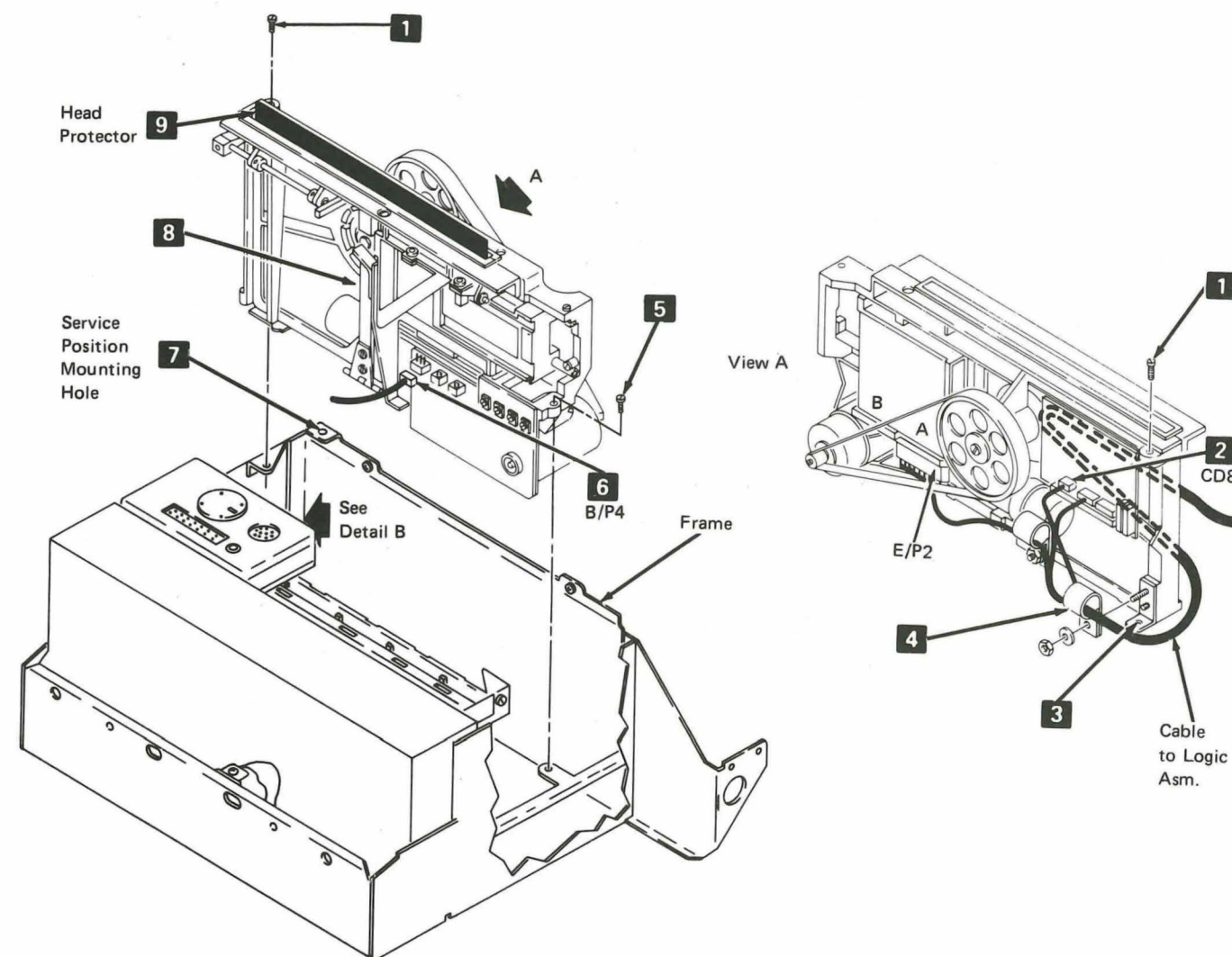
1. Place the K/D on a flat surface, face down. Keep the K/D in this position throughout the procedure to prevent the keybuttons from falling out.
2. Remove the four screws **5**. This releases the front cover **1** from the logic assembly **2** and the back cover **3**.
3. Carefully lift the back cover **3** and logic assembly **2** off the front cover **1**. The keybuttons should remain in the front cover.
4. Remove the two screws **6**.
5. Remove the four screws **4**.
6. Remove the back cover **3** from the K/D logic assembly **2**.

Assembling

Reverse the disassembling procedure.

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Diskette Drive Assembly



Removal

1. Remove the top cover (see page 3-3).
2. Ensure that the head protector **9** is in place and the heads are loaded.
3. Remove the mounting screws **1** and **5**.
4. Carefully lift the diskette drive out of the frame.
5. To service or adjust the diskette drive with power on, mount the diskette drive in the service position on the frame as follows:
 - a. Install the mounting screw **1** into the threaded hole **7** in the back frame.
 - b. Slip the slot in the bracket **3** under the screw head.
 - c. Pivot the right-hand end of the diskette drive either forward (approximately 90 degrees) so it is supported by the top of the logic assembly or pivot it toward the rear of the frame so that it is parallel to and supported by the rear of the frame.
 - d. Tighten the mounting screw **1**. This will hold the diskette drive in an upright position for servicing as shown in the Service Position illustration on page 3-28.

Note: Ensure that the diskette drive motor pulley does not rub on any part of the MD-2 while the diskette drive assembly is in the service position and running.

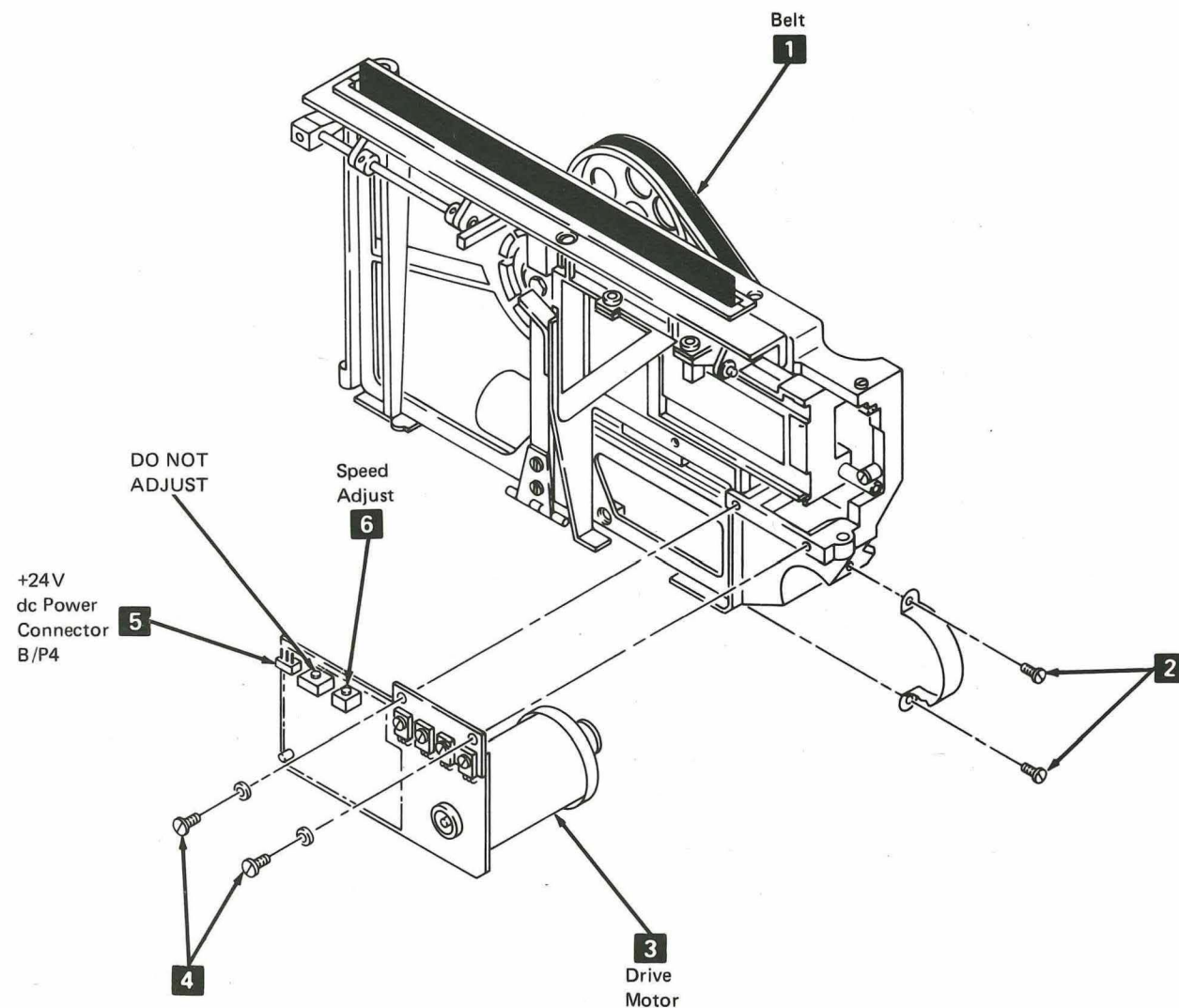
6. To completely remove the diskette drive from the frame, loosen the cable retainer screw **11** on the logic assembly connector panel, and remove the cable retainer **10**.
7. Unplug the diskette drive cable from logic board position C2 (see page 3-6).
8. Disconnect cable CD8 **2** from the zero stop card and remove from the cable clamp **4**.
9. Disconnect the cable B/P4 **6** from the diskette drive motor card.

Warning: Handle the diskette drive unit carefully to prevent damaging it when removing it from the MD-2 frame.

Replacement

Reverse the removal procedure using care to route cables so that they do not get behind the collet leaf spring **8**, obstruct diskette insertion, or that the cables are not pinched when the diskette drive unit is reinstalled in the frame. Also ensure that the CD8 (+5 Vdc) and B/P4 (+24 Vdc) cables are not swapped when reconnecting them.

Diskette Drive Assembly (Continued)



Diskette Speed Check

The diskette speed is checked by the ROS tests during each IPL. If the diskette speed is too fast or too slow, one of the following messages is displayed only if speed errors are sensed:

FILE TEST
FILE FAST hh.hh MS

or

FILE TEST
FILE SLOW hh.hh MS

(hh.hh = milliseconds in hexadecimal)

If either message is displayed, adjust the drive motor speed

Drive Motor Speed Adjustment

Ensure that the temperature of the diskettes and the diskette drive are approximately equal before making this adjustment.

1. The diskette drive normally does not have to be removed from the frame to perform this adjustment.
2. Power on the MD-2.
3. Check that the voltage at the dc power connector B/P4 (5) is between 21.2 and 26.8 Vdc. If the voltage is not within this range, correct by exchanging the power supply (see page 3-11) or the dc distribution cable (see page 3-8).
4. Set the LOAD/OPEN lever to the OPEN position.
5. Insert a diskette into the diskette drive.
6. When FILE NOT READY is displayed, press the 1 key on the K/D. (This initiates the ROS diskette speed test.)
7. Set the LOAD/OPEN lever to the LOAD position. The diskette speed test starts and the following message is displayed:

FILE TEST (FAST or SLOW) hh.hh MS

Note: The diskette speed varies while the speed test is running. The display changes every 3 or 4 seconds.

8. Record the average fast or slow time for this diskette.
9. Repeat steps 5, 6, 9, and 10, using at least two other diskettes (if available). Use the diskette with an average-speed for the following steps.
10. Insert the average speed diskette into the diskette drive.
11. Set the LOAD/OPEN lever to the LOAD position.
12. Turn the potentiometer (6) clockwise to increase the motor speed or counterclockwise to decrease the motor speed. Adjust the potentiometer until the average display message is approximately 00.nn (nn = any hexadecimal digit).

Exchange the diskette drive motor if the adjustment cannot be made.

13. Press the IPL RESET switch to stop the diskette speed test.
14. Power off the MD-2.
15. Replace the diskette drive in the frame (see page 3-29).

Diskette Drive Motor

Removal

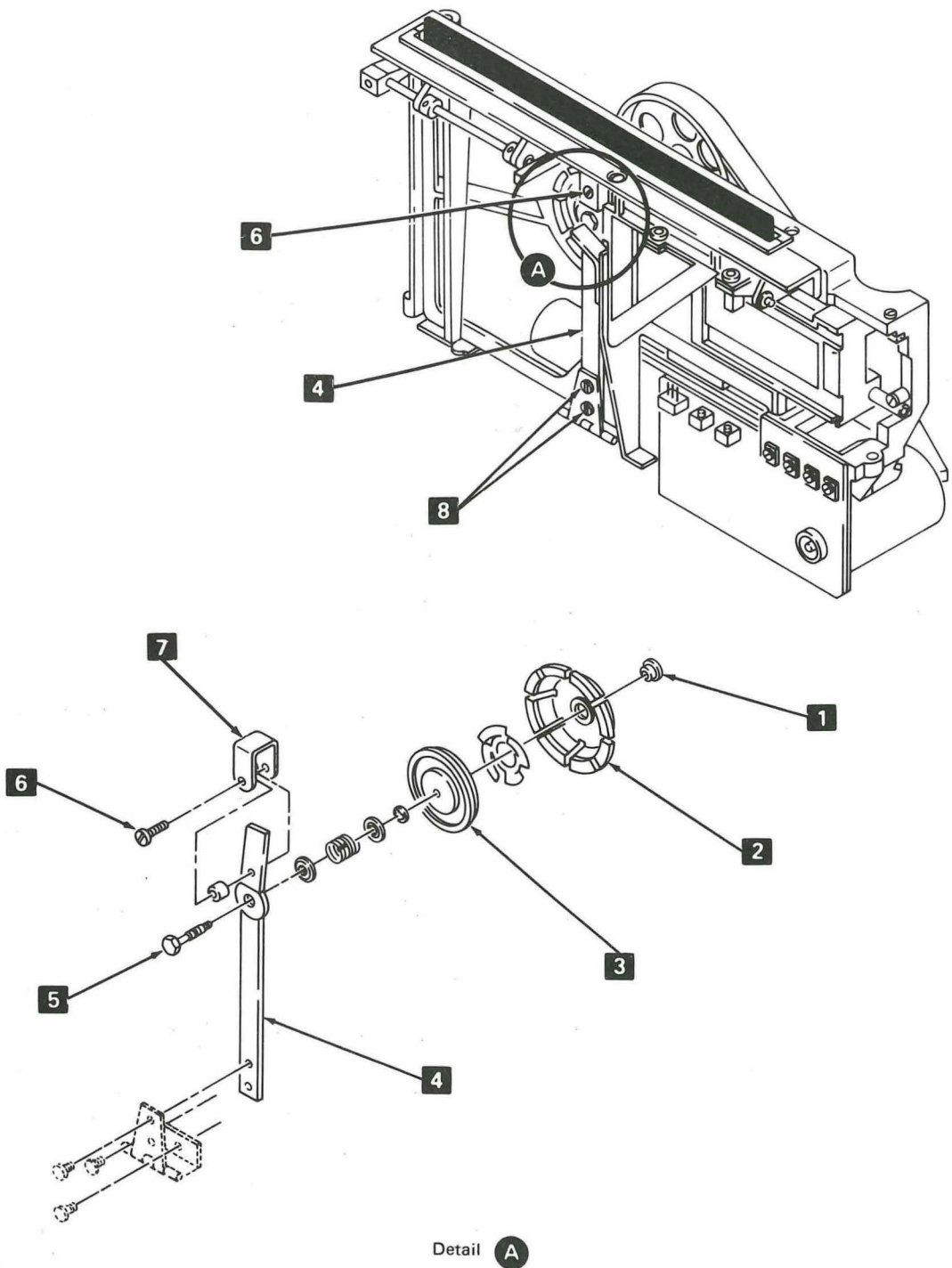
1. Remove the diskette drive from the frame and mount it in the service position (see page 3-29).
2. Remove the drive belt (1).
3. Remove the dc power connector (5).
4. Remove the motor clamp screws (2).
5. Remove the drive-motor-assembly mounting screws (4).
6. Remove the drive motor assembly (3).

Replacement

Reverse the removal procedure and then adjust the drive motor speed using the adjustment procedure on this page.

Note: Ensure that the diskette drive cables are not causing a bind on the diskette drive.

Diskette Drive Assembly (Continued)



Detail A

PN 5687026 01 APR 81
Present EC: 344569
Previous EC: None
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Collet and Cone

Removal

1. Remove the diskette drive from the frame and mount it in the service position (see page 3-29).
2. Remove the screw 6 from the guide spring.
3. Remove the two screws 8 from the collet leaf spring.
4. Remove the collet assembly and leaf spring 4 from the diskette drive.
5. Remove the collet holding nut 1 to remove the collet 2 and cone 3 from the leaf spring 4 (see detail A).
6. Exchange the defective part.

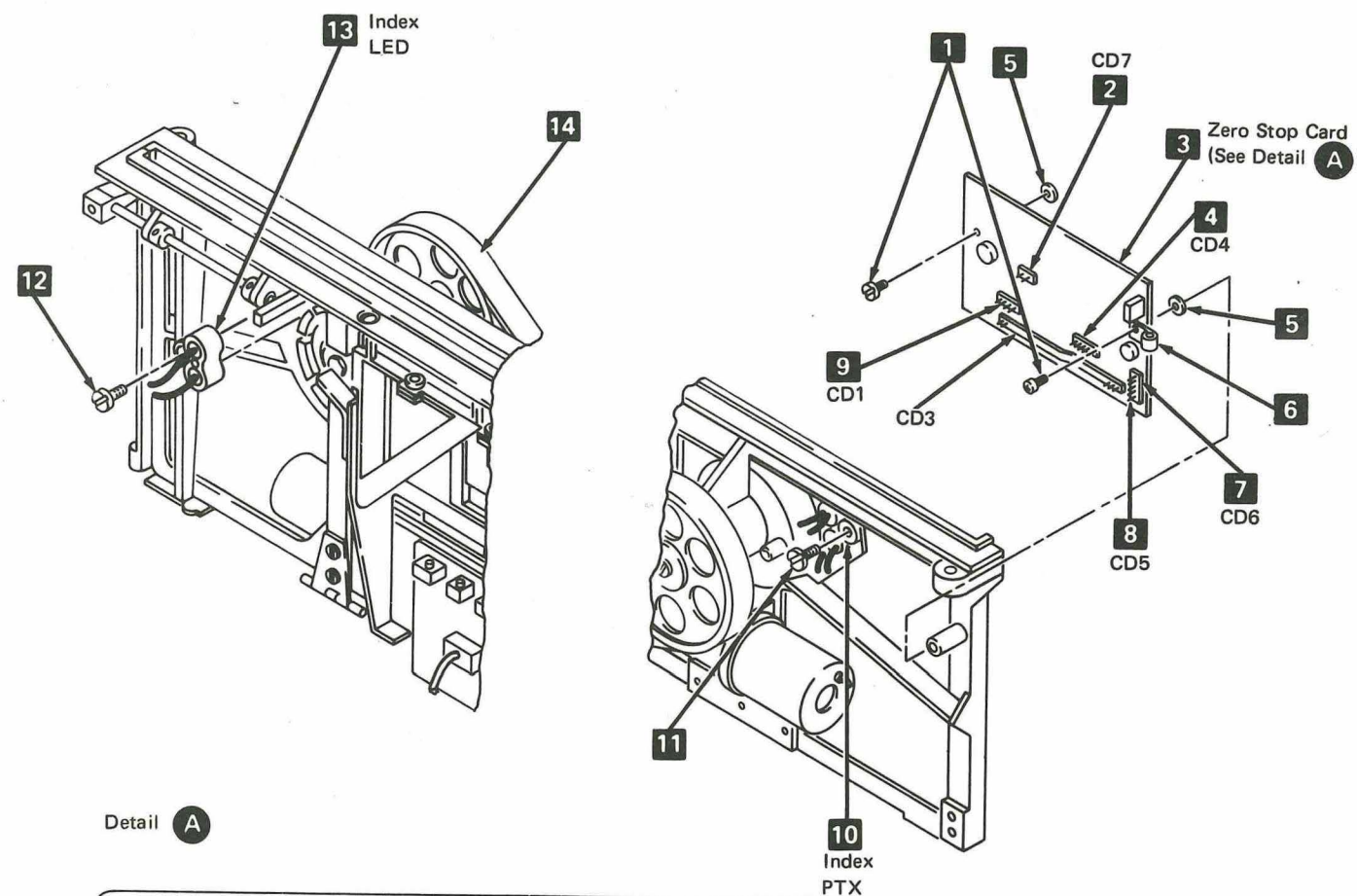
Replacement

1. Assemble the collet 2 and cone 3 on the leaf spring 4.
2. Replace the screws 8 leaving them loose.
3. Replace screw 6 and guide 7.
4. Turn the LOAD/OPEN lever to LOAD.
5. Ensure that the stud 5 is centered in the mating hole in the leaf spring 4.
6. Tighten the bottom screw 8 and then the top screw 8.
7. Ensure that the cone is not binding when loading and unloading the diskette heads.
8. Reinstall the diskette drive in the frame (see page 3-29).

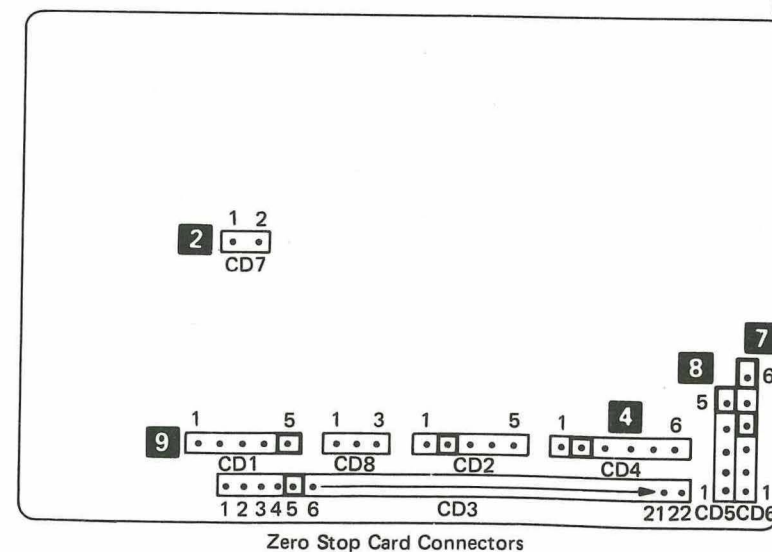
PN 5687026 01 APR 81
Present EC: 344569
Previous EC: None
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LEDs and Phototransistors

See page 3-49 for wiring diagram.



Detail A



Index LEDs

Service Check

1. Remove the diskette drive from the frame and mount it in the service position (see page 3-29).
2. Disconnect CD5 **8** from the zero stop card **3**.
3. Zero the CE meter on the Rx1K scale and connect it to the CD5 cable connector as follows:
+ lead to CD5-1 (red wire)
- lead to CD5-2 (black wire)
4. The resistance should be greater than 10,000 ohms.
5. Reverse the meter leads.
6. The resistance should be less than 3,000 ohms.
7. Check the other index LED by using the above procedure with the meter connected to the CD5 cable connector as follows:
+ lead to CD5-3 (red wire)
- lead to CD5-4 (black wire)

Removal

1. Remove the diskette drive from the frame and mount it in the service position (see page 3-29).
2. Disconnect cable CD5 **8** at the zero stop card **3**.
3. Remove the cable clamp **6** and the insulating washer **5** from the zero stop card **3**.
4. Remove the LED holding screw **12** and remove the LED assembly **13**.

Replacement

Reverse the removal procedure. The index LEDs are self-locating; alignment is not necessary. Ensure that the insulating washers **5** are installed with the zero stop card as shown in the illustration on page 3-34.

Index Phototransistors (PTXs)

Service Check

1. Remove the diskette drive from the frame and mount it in the service position (see page 3-29).
2. Remove the drive belt **14**.
3. Disconnect CD6 **7** from the zero stop card **3**.
4. Zero the CE meter on the Rx10 scale and connect it to the CD6 cable connector as follows:
+ lead to CD6-2 (black wire)
- lead to CD6-1 (yellow wire)
5. Power on the MD-2.
6. Insert a diskette into the MD-2 while watching the meter.
7. The resistance should change each time the diskette is inserted or removed.
8. Check the other index PTX by repeating the above procedure with the CE meter connected to the CD6 cable connector as follows:
+ lead to CD6-5 (black wire)
- lead to CD6-3 (yellow wire)

Removal

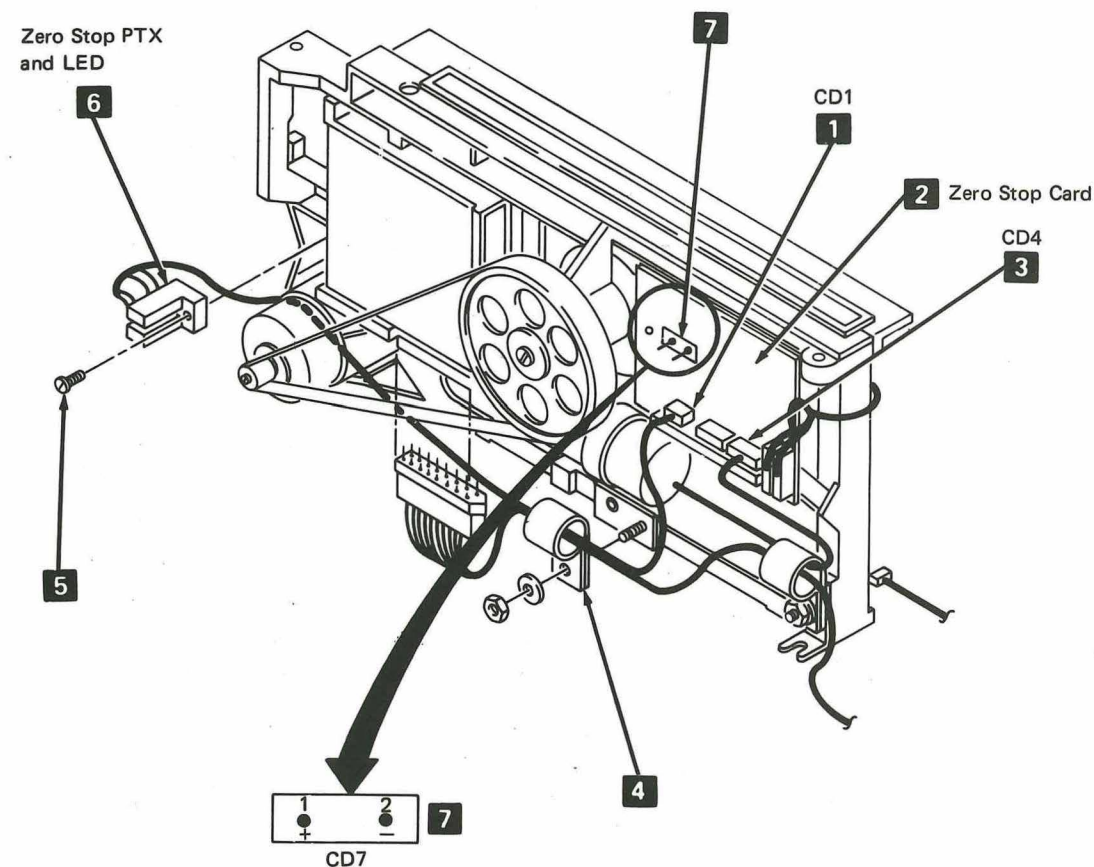
1. Remove the diskette drive from the frame and mount it in the service position (see page 3-29).
2. Disconnect cable CD6 **7** from the zero stop card.
3. Remove the cable clamp **6** and the insulating washer **5** from the zero stop card **3**.
4. Remove two screws **1** and remove the zero stop card.
5. Remove the PTX holding screw **11** and remove the PTX assembly **10**.

Replacement

Reverse the removal procedure. The index PTX is self-locating; alignment is not necessary. Ensure that the insulating washers **5** are installed on the zero stop card as shown in the illustration on page 3-34.

LEDs and Phototransistors (Continued)

See page 3-49 for wiring diagram.



Zero Stop LED and Phototransistor (PTX)

Service Check

1. Remove the diskette drive from the frame and mount it in the service position (see page 3-29).
2. Turn the leadscrew by grasping the leadscrew/motor coupling (10 page 3-38) and move the head/carriage to its center of travel.
3. Disconnect CD4 3 from the zero stop card 2.
4. Set the CE meter to read + 4 Vdc and connect as follows:
+ lead to CD7-1 7
- lead to CD7-2 7
5. Power on the MD-2. The CE meter should read approximately 0 Vdc.
6. Insert a thick piece of paper into the zero stop sensor 6 to block the light from the LED.
7. The meter should read approximately +4 Vdc with the light blocked.
8. If the meter reading does not change, one of the following FRUs is failing: zero stop card or zero stop LED/PTX assembly.

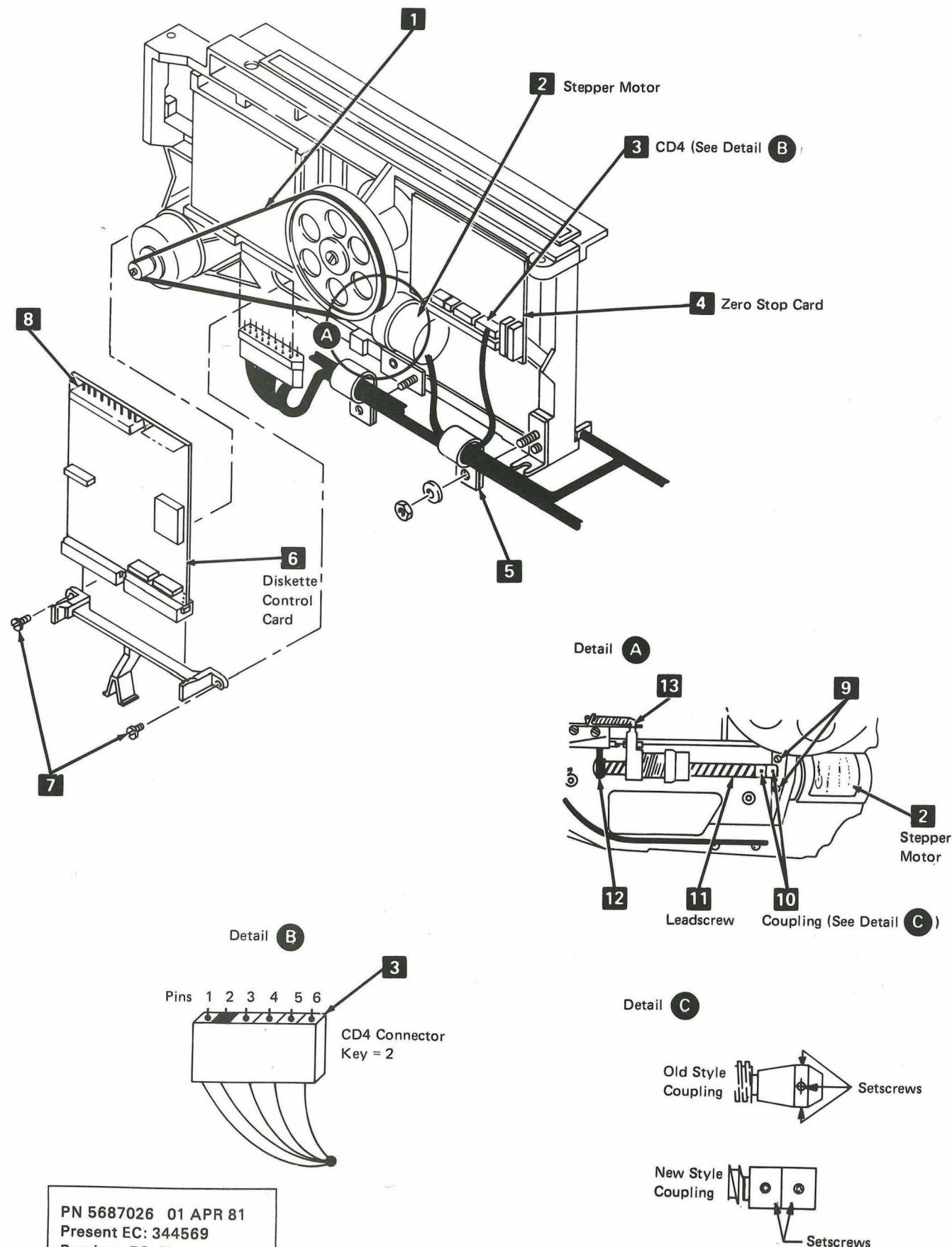
Removal

1. Remove the diskette drive from the frame and mount it in the service position (see page 3-29).
2. Disconnect cable CD1 1 from the zero stop card.
3. Remove the cable clamp 4.
4. Remove the LED/PTX holding screw 5 and remove the LED/PTX assembly 6 (note the cable path for replacement).

Replacement

Reverse the removal procedure. Perform the track zero alignment on page 3-47.

Stepper Motor



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Present EC: 344569
Previous EC: None
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Service Check

1. Remove the diskette drive from the frame and mount it in the service position (see page 3-29).
2. Unplug the stepper motor cable (CD4) 3 from the zero stop card.
3. Zero the CE meter on the Rx1 scale.
4. Make the following resistance measurements on the stepper motor cable connector (CD4) 3.

Connector Pins	Resistance
1-3 1-4 1-5 1-6	45 - 67 Ohms
3-4 3-5 3-6 4-5 4-6 5-6	90-134 Ohms

5. If any of the resistance measurements are wrong, exchange the stepper motor.

Removal

Warning: The leadscrew is not field replaceable. The diskette drive must be replaced if the lead screw is damaged.

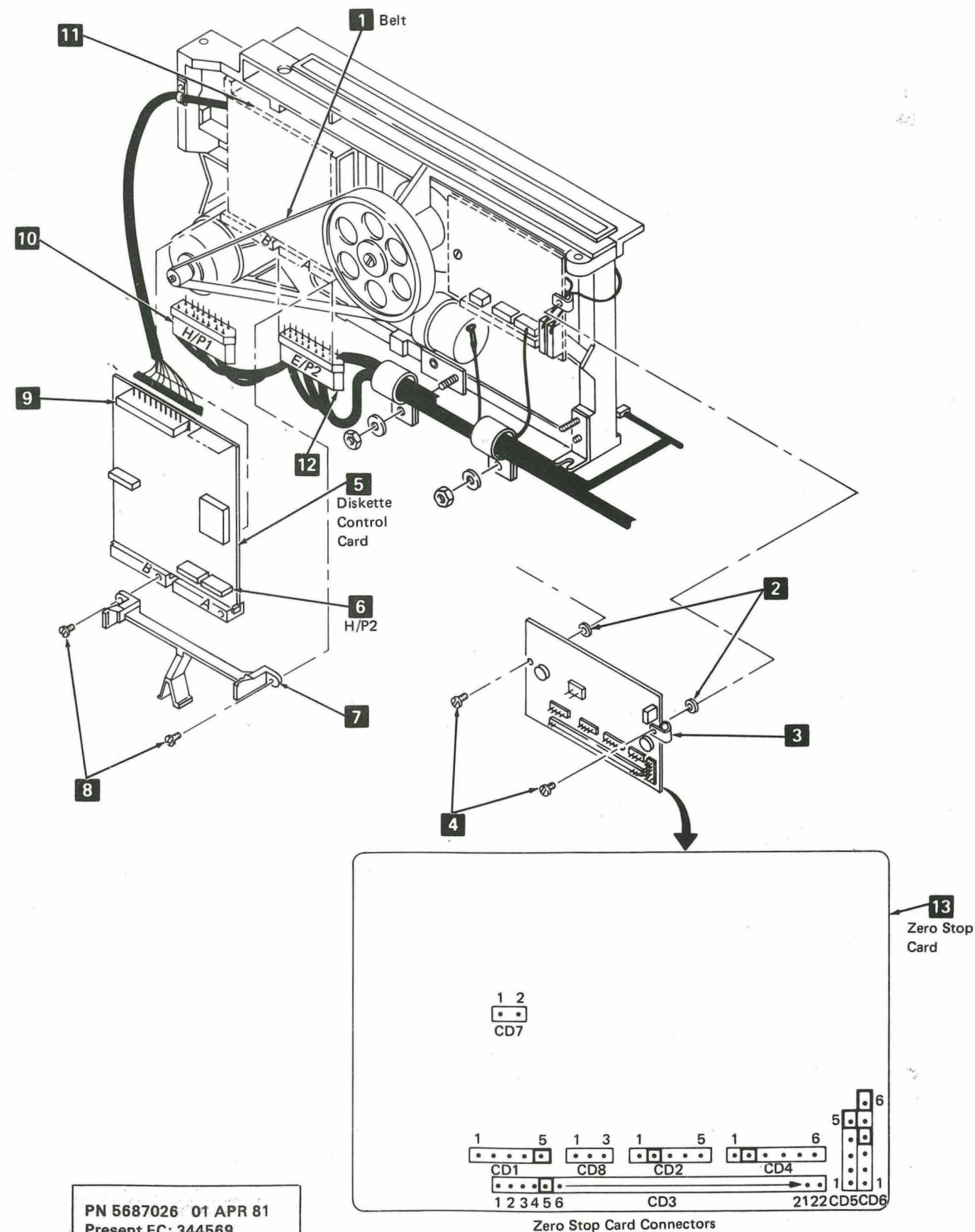
1. Remove the diskette drive from the frame and mount it in the service position (see page 3-29).
2. Remove the drive belt 1.
3. Turn the leadscrew 11 to move the head/carriage to track 0 (see Detail A).
4. Disconnect the head connector 8 from the diskette control card 6.
5. Remove the two lower diskette-control-card holding screws 7 and slide the card out of the upper bracket.
6. Loosen the leadscrew/motor coupling setscrew 10 (the one next to the stepper motor) (see Detail A).
7. Disconnect the stepper motor cable (CD4) 3 from the zero stop card 4.
8. Remove the cable clamp 5.
9. Remove the two stepper-motor mounting screws 9 (see Detail A).
10. Hold the leadscrew 11 and remove the stepper motor 2 from the end of the leadscrew (see Detail A).

Replacement

1. Reverse the removal procedure.
2. Be sure the left end of the leadscrew 11 is completely through the left bearing 12 and the post 13 is centered in its slot before tightening the setscrews (10).
3. Align the head/carriage (see page 3-45).

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Present EC: 344569
Previous EC: None
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Diskette Drive Logic Cards



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Present EC: 344569
Previous EC: None
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3-40

Diskette Control Card

Removal

1. Remove the diskette drive from the frame and mount it in the service position (see page 3-29).
2. Disconnect the head cable **9**.
3. Remove the drive belt **1**.
4. Disconnect the H/P2 cable **6**.
5. Remove the two screws **8**.
6. Slide the card **5** out of the upper bracket **11**.
7. Disconnect the two cables, H/P1 **10** and E/P2 **12**, from the bottom of the diskette control card.
8. Remove the lower bracket **7** from the card.

Replacement

Reverse the removal procedure.

Zero Stop Card

Removal

1. Remove the diskette drive from the frame and mount it in the service position (see page 3-29).
2. Disconnect all cables (CD1 through CD8) from the zero stop card **13**.
3. Remove the two mounting screws **4** and remove the card. Do not lose the insulating washers **2** between the card and the frame.

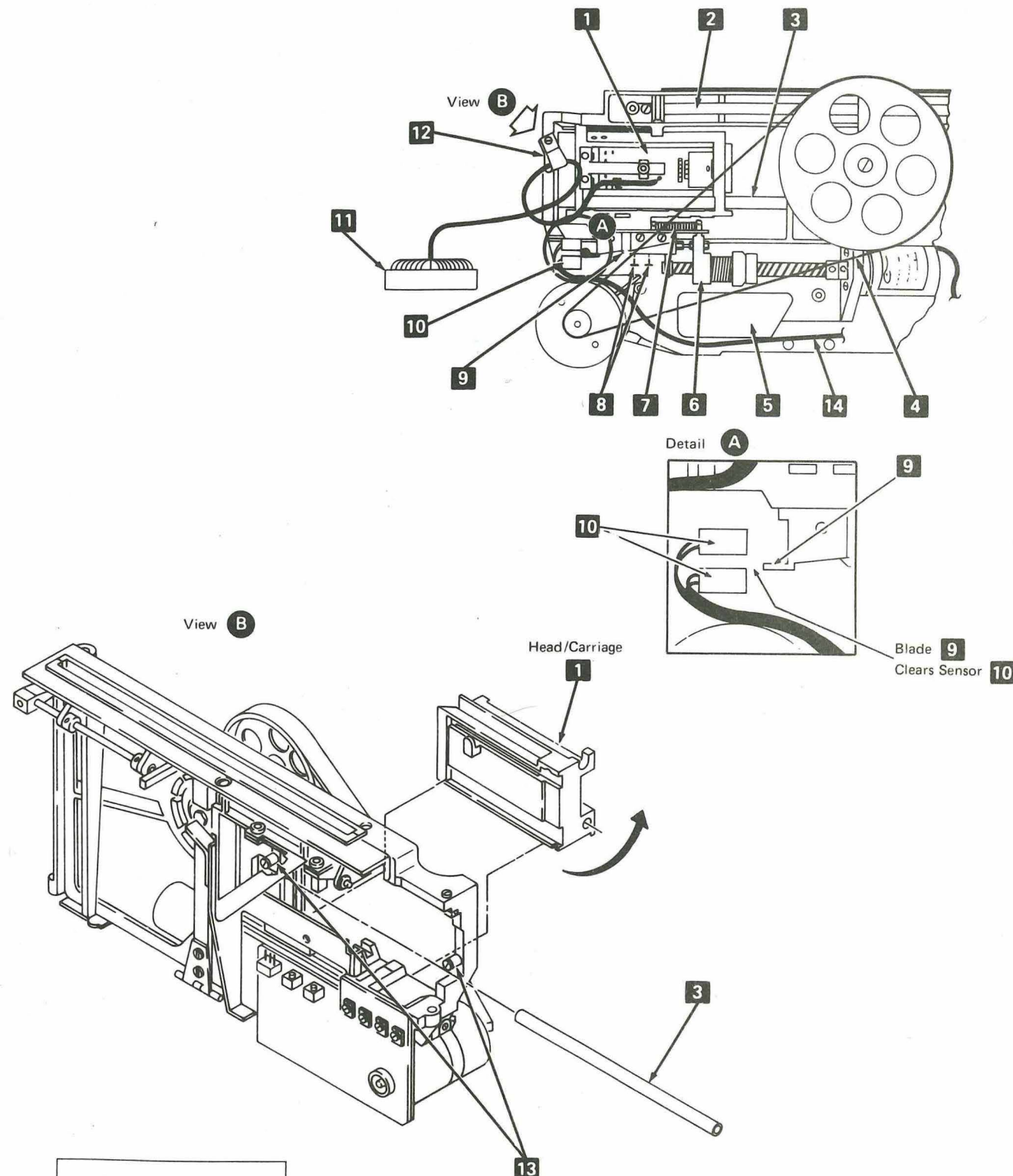
Replacement

Reverse the removal procedure and be sure the insulating washer is between the card and the frame.

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Present EC: 344569
Previous EC: None
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Maintenance Information 3-41

Head/Carriage Assembly



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Present EC: 344569
Previous EC: None
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Head/Carriage Service Check

Inspect the head/carriage cable for broken wires. Exchange the head/carriage assembly if unable to repair.

Removal

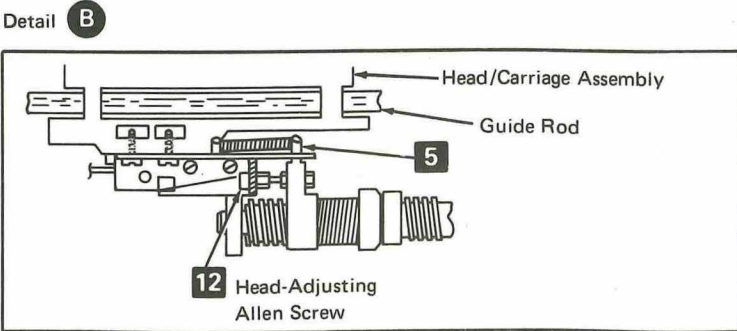
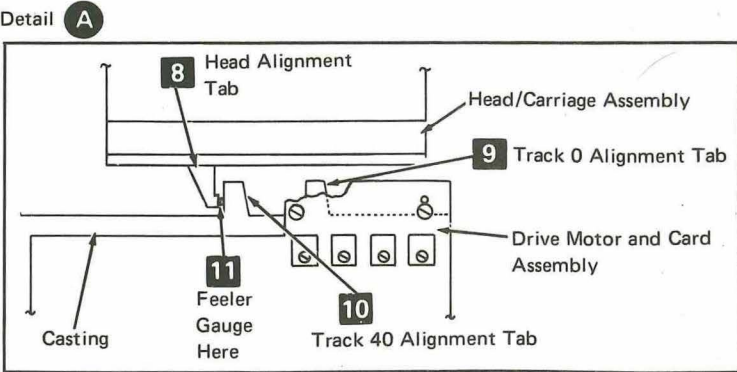
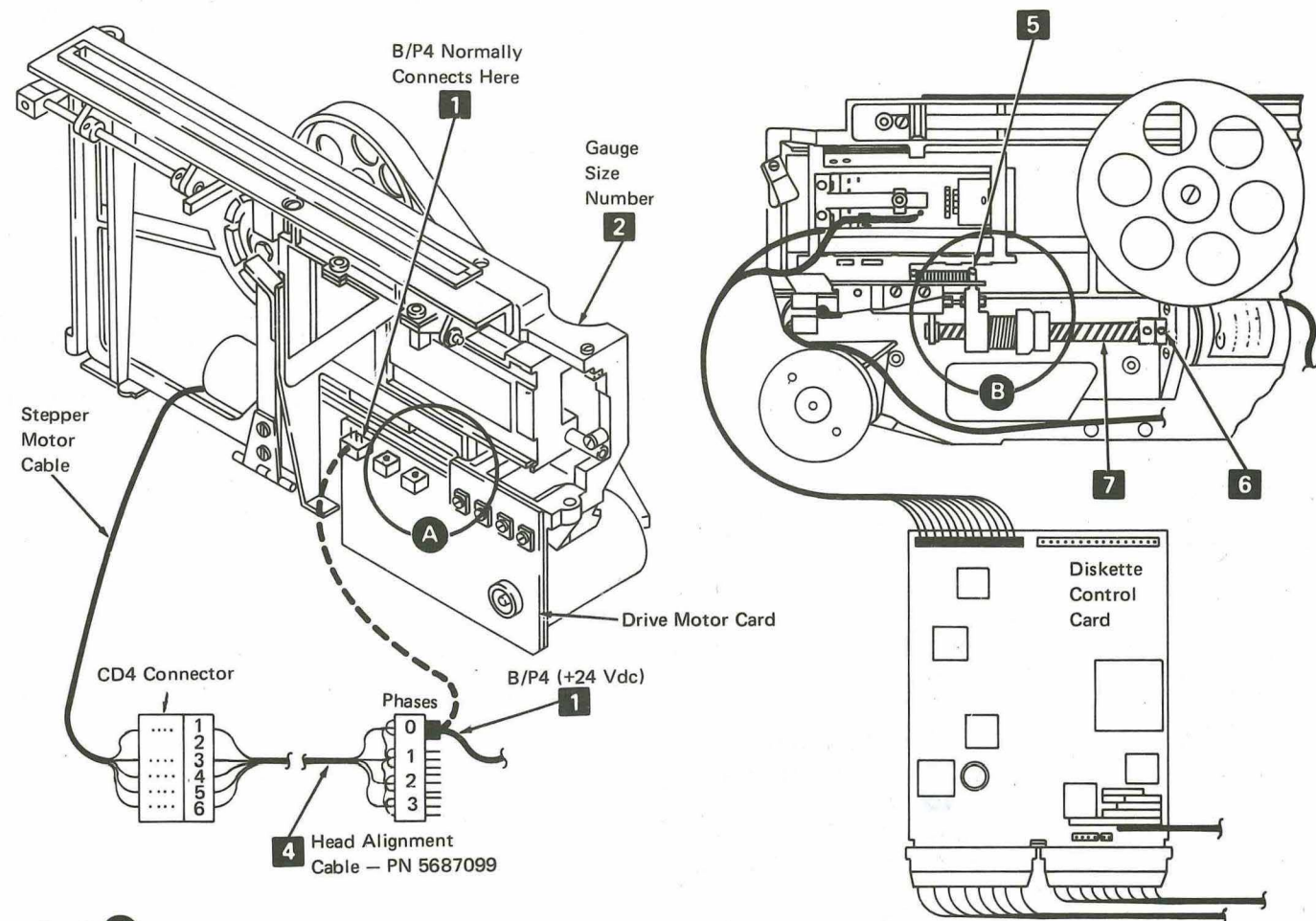
1. Remove the diskette drive from the frame and mount it in the service position (see page 3-29).
2. Set the LOAD/OPEN lever to the LOAD position.
3. Remove the diskette control card (see page 3-41).
4. Remove the head cable clamp screw and washer 12.
5. Turn the leadscrew 4 to set the head/carriage so that the head bracket blade 9 clears the zero stop sensor 10.
6. Remove the lead screw linkage spring 7.
7. Loosen the two lower guide clamping screws 13 (see View B).
8. Hold the head/carriage 1 assembly and slide the lower guide 3 out of the head/carriage.
9. Remove the head/carriage by lifting up and tilting out the bottom of the head to clear the carriage nut post 6. As the head/carriage is removed, the post on the carriage nut will come out of the slot in the head bracket.
10. Remove the two screws 8 from the lead screw linkage and remove the linkage.

Replacement

1. Reverse the removal procedure.
 - Ensure that the end of the guide rod 3 is flush with the outside edge of the diskette drive frame. Do not over-tighten the guide rod screws 13.
 - The head bracket must be parallel to the head/carriage.
 - The head cable 11 must have enough slack to allow the head/carriage to move to the inside track. See the illustration on page 3-42 for cable path.
 - The post 6 on the carriage nut should be centered in the slot on the head bracket.
 - The zero stop LED/PTX cable 14 must be below the diskette control card lower mounting bracket.
2. Align the head/carriage (see page 3-45).

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Present EC: 344569
Previous EC: None
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Head/Carriage Assembly (Continued)



Note: Diskette control card is shown removed for clarification of Detail B only. Leave card mounted when adjusting the head/carriage.

Head/Carriage Alignment - Track 40

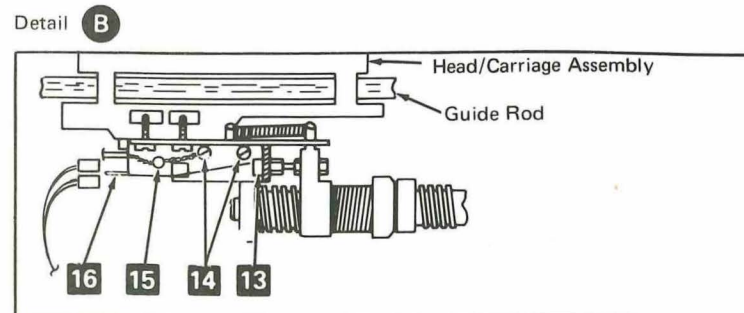
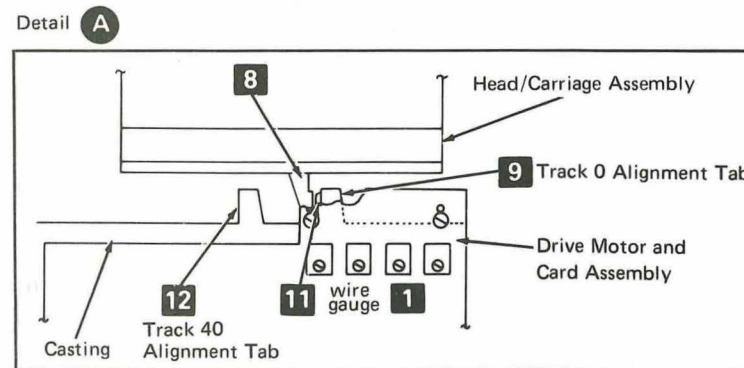
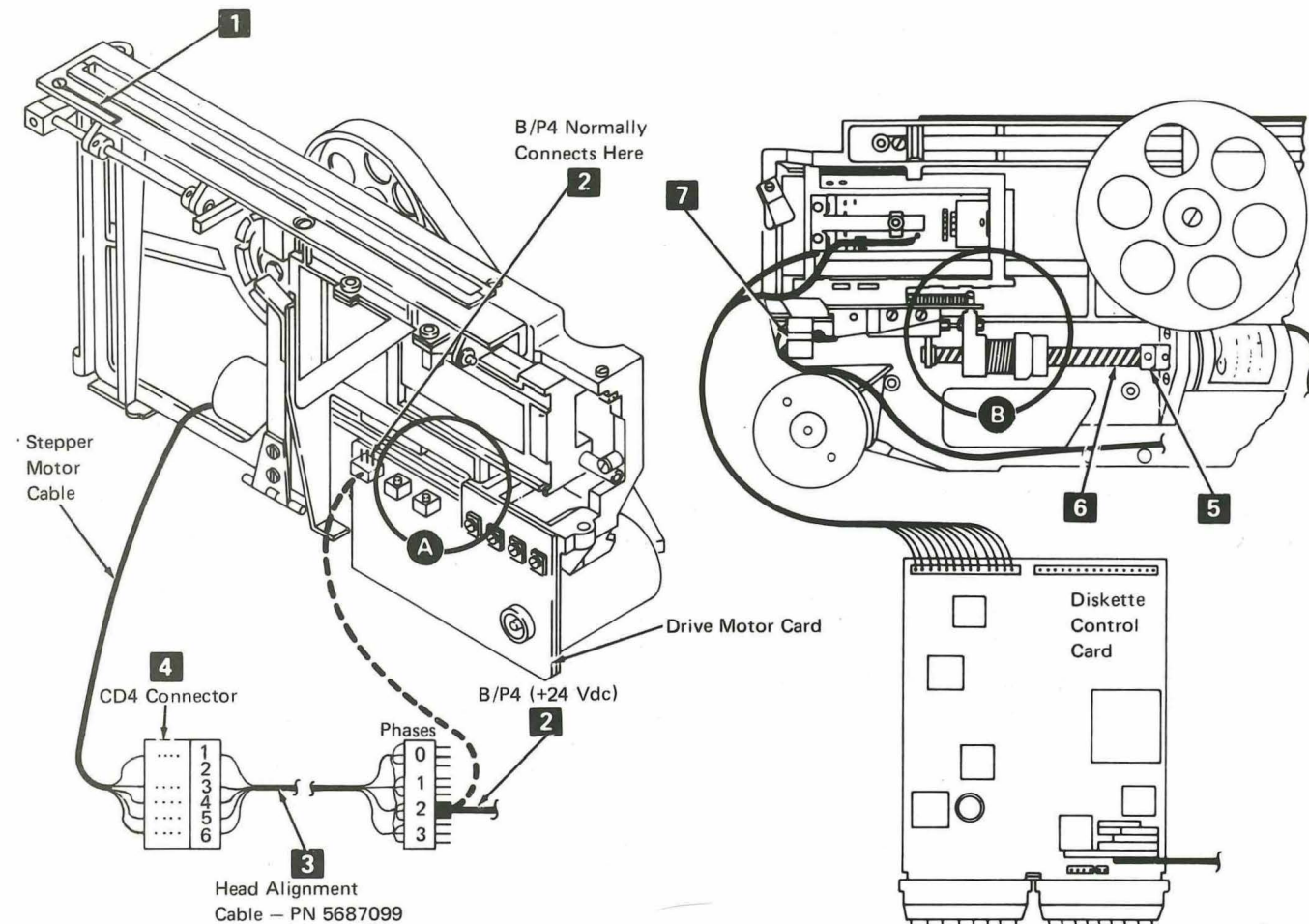
1. Ensure that power is off to the MD-2.
2. Remove the diskette drive from the frame and mount it in the service position (see page 3-29).
3. Disconnect the stepper motor cable from CD4 on the Zero Stop card (see page 3-48).
4. Disconnect cable B/P4 from the diskette drive motor card 1.
5. Connect the head alignment cable 4 (PN 5687099) to the stepper motor cable CD4.
6. Connect cable connector B/P4 1 to phase 1 on the head alignment cable 4.
7. Set the LOAD/OPEN lever to LOAD.
8. Verify that the post 5 is centered in its slot before making any adjustments. If the post is not centered, loosen the coupling setscrew 6 next to the leadscrew and slide the leadscrew 7 right or left to center the post 5. Tighten the setscrew in the coupling after the centering adjustment is completed.
9. Turn the leadscrew 7 by grasping the coupling at 6 and move the head/carriage to the track 40 alignment tab 10 (see Detail A).
10. Check the number stamped on the diskette frame 2. This is the correct feeler gauge size for the track 40 alignment. This number may be from 17 to 23 (or blank) as shown following:

Number on Frame	Gauge Size
Blank	.020 in.
17	.017 in.
18	.018 in.
19	.019 in.
20	.020 in.
21	.021 in.
22	.022 in.
23	.023 in.

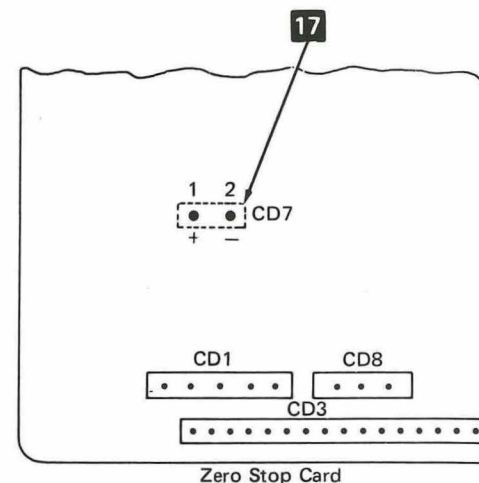
Insert the correct feeler gauge between the head/carriage alignment tab 8 and the track 40 alignment tabs 10. The gauge must span the gap between the two track 40 alignment tabs 10 (see Detail A).

11. Turn the leadscrew until the two alignment surfaces just touch the gauge 11.
12. Remove the feeler gauge. The head should not move when the gauge is removed.
13. Power on the MD-2.
14. Connect cable connector B/P4 1 to phase 0 on the head alignment cable 4.
15. Insert the correct feeler gauge between the head/carriage alignment tab 8 and the track 40 alignment tabs 10. The gauge must span the gap between the two track 40 alignment tabs 10 (see Detail A).
16. If the gap between the two alignment tab surfaces has changed from the gap attained in step 10, continue with the next steps. If the gap has not changed from the one attained in step 10, do the track zero alignment (see page 3-47).
17. With the MD-2 powered on, insert the feeler gauge (at 90-degree angle to the head/carriage).
18. Turn the head/carriage-adjusting allen-head screw 12 (see Detail B) until both alignment tab surfaces just touch the feeler gauge at 11 with no head movement. (This requires an allen wrench approximately 3 inches long.)
19. Do the track zero alignment (see page 3-47).

Head/Carriage Assembly (Continued)



Note: Diskette control card is shown removed for clarification of Detail B only. Leave card mounted when adjusting the head/carriage.



Head/Carriage Alignment - Track 0

This procedure uses the .020 wire gauge **1** stored on the frame of the diskette drive. Return the gauge to its storage position after you complete this procedure.

1. Remove the diskette drive from the frame and mount it in the service position (see page 3-29).
- Note:** Do not remove the diskette control card from the diskette drive.
2. Ensure that the zero stop LED and phototransistor (PTX) service check is correct (see page 3-37).
3. Disconnect the stepper motor cable CD4 from the zero stop card (see page 3-48).
4. Disconnect cable B/P4 **2** from the diskette drive motor card.
5. Connect the head alignment cable **3** (PN 5687099) to the stepper motor cable CD4 **4**.
6. Connect cable connector B/P4 **2** to phase 2 on the head alignment cable **3**.
7. Set the LOAD/OPEN lever to LOAD.
8. Set a CE meter to read +5 Vdc and connect as follows:

+ lead to CD7-TP1 **17**

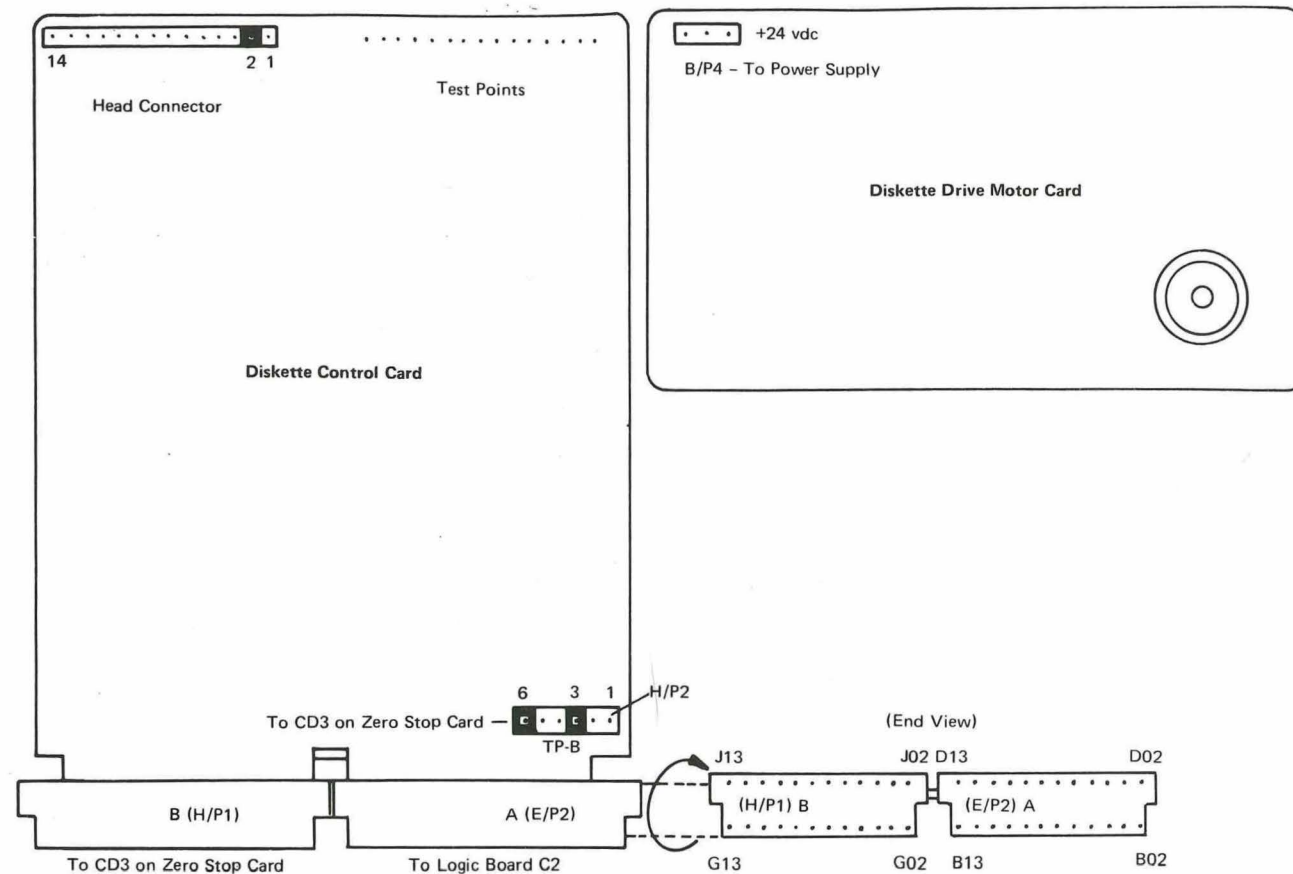
- lead to CD7-TP2 **17**

9. Turn the leadscrew **6** clockwise (by grasping the coupling at **5**) and move the head/carriage to track 0.
10. Insert the .020 wire gauge (PN 5687085) **1** between the track 0 alignment tab **9** on the casting and the head alignment tab **8** on the head/carriage (see Detail A).
11. Turn the leadscrew until the two alignment surfaces just touch the gauge at **11**.
12. Remove the gauge.

13. Power on the MD-2.
14. Unplug cable connector B/P4 from the head alignment cable **3** and touch phases 3 and 2 alternately. Check the meter reading after touching each phase. Phase 3 should read 0 Vdc and phase 2 should read +4 Vdc. If the meter changes from 0 Vdc to +4 Vdc alternately, the track 0 alignment is correct, go to step 21. If the meter does not change from +4 Vdc to 0 Vdc, continue with the next step.
15. Ensure that B/P4 is connected to phase 2 on the head alignment cable, the MD-2 is powered on, and the gap at point **11** is approximately 0.5 mm (0.020 in.).
16. Loosen the two screws **14** just enough to move the blade **16**.
17. Using a pointed object in the hole at **15**, move the zero stop blade **16** to the right until the meter reads 0 volts.
18. Move the blade **16** to the left just enough to change the meter reading to +4 Vdc.
19. Ensure that the blade **16** is centered in the slot **7** and then tighten the two screws **14**.
20. Go to step 14 and recheck the adjustment.
21. Power off the MD-2.
22. Remove the test cable **3** and plug the stepper motor cable into CD4 on the zero stop card (see **3** page 3-38). Plug B/P4 into its connector on the the diskette drive motor card.
23. Disconnect the CE meter.
24. Insert a maintenance diskette and power on the MD-2.
25. If the IPL tests run without error, replace the diskette drive in the frame (see page 3-29).

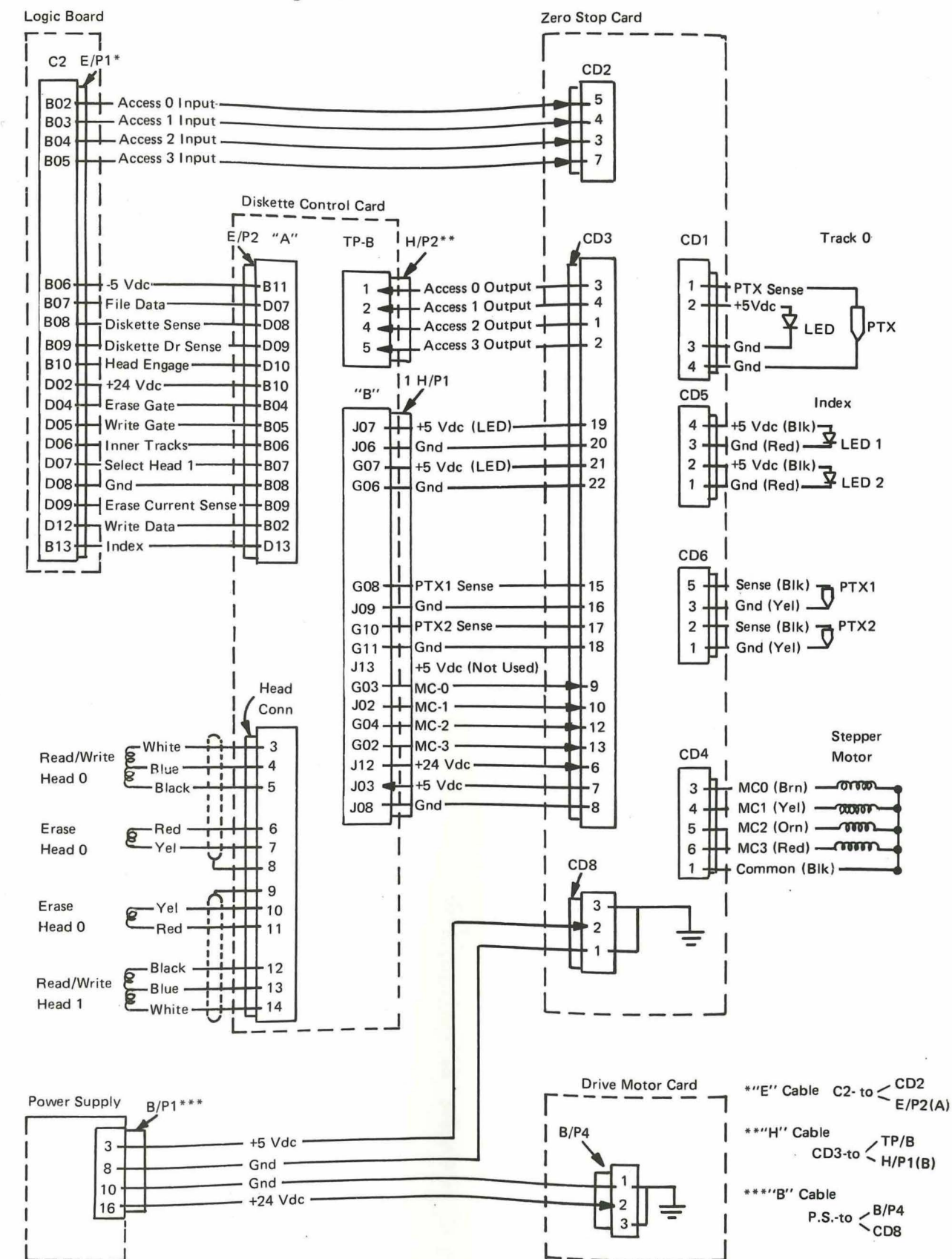
Diskette Drive Connectors

See page 3-49 for diskette wiring schematic



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Present EC: 344569
Previous EC: None
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Diskette Drive Wiring Diagram



Chapter 4. Adapter Cable and Plug Wiring

Adapter Plugs

S-Loop Adapter Wiring

Cable Connector	S-Loop Plug
2	R
1	GN
18	Y
17	BK
11	
12	

R-Loop Adapter Wiring

Cable Connector	R-Loop Connector
2	2
1	3
18	4
17	5
3	6
23	7
11	8
27	1
26	

DTE/DCE Adapter Cable Wiring

Connector	Plug
2	2
3	3
4	4
5	5
6	6
7	7
8	8
11	11
14	14
15	15
17	17
18	18
20	20
22	22
23	23
24	24
1 -Outer Shield-	1
7 -Individual-	7
Shields	

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 Present EC: 344569
 Previous EC: None
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Chapter 5. Tools and Test Equipment

The tools and test equipment needed to use or service the Maintenance Device are divided into the following four groups:

CE tools
 Branch office tools
 Tools shipped with the MD-2
 Accessories

CE TOOLS

- Standard CE Tool Kit

These are the tools normally used by the CE.

- Metric Tool Kit — BM 1749235

This kit contains wrenches and tools in metric sizes.

- Berg* Unlatch Tool — PN 453705

This tool must be used to remove Berg connector pins.

- Berg Probe Tip — PN 453718

This probe tip is used to connect a meter or oscilloscope to Berg connector pins.

BRANCH OFFICE TOOLS

- Head Alignment Cable — PN 5687099

This cable is used for diskette head/carriage alignment.

TOOLS SHIPPED WITH THE MD-2

- Maintenance Diskette — PN 8547642

- Port Wrap Plugs

DTE — PN 8547663

R-Loop — PN 8547628

S-Loop — PN 8547629

- These plugs are used during diagnostic procedures to test the MD-2 communication ports. See page 5-2 for wiring diagrams.
- Diskette Head Protector — PN 917363

This protector is inserted into the diskette slot in the MD-2 to protect the heads when the MD-2 is not being used or is being serviced.

- Keyboard/Display Hanger Bracket — PN 8547718 (without bumpers)

- Keyboard/Display Hanger Bracket — PN 4499613 (with bumpers)
- Diskette Head/Carriage Alignment Wire Gauge — PN 5687085
- DTE/DCE Cable, 1.5 m (4 ft) — PN 8547668

ACCESSORIES

The following accessories (not shipped with the MD-2) are used to connect the MD-2 to a product under test:

- DTE/DCE Cable, 15.2 m (50 ft) — PN 8547667
- R-Loop Adapter — PN 918125
- S-Loop Adapter — PN 918126

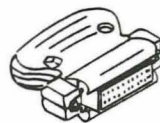
* Trademark of E. I. DuPont de Nemours and Co., Inc.

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 Present EC: 344569
 Previous EC: None
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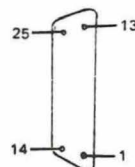
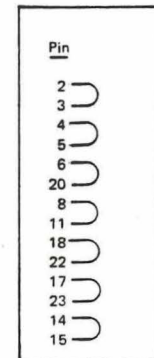
Wrap Plugs and Head Alignment Cable

Wrap Plug Wiring Diagrams

DTE Wrap Plug
PN 8547663



DTE Wrap Plug Wiring

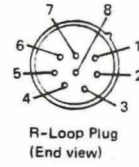
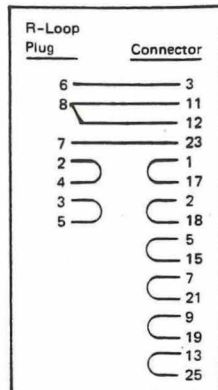


DTE Wrap Plug
(End view)

R-Loop Wrap Plug
PN 8557628

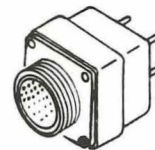


R-Loop Wrap Plug Wiring

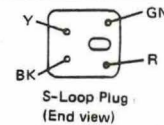
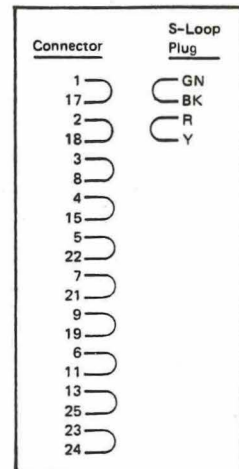


R-Loop Plug
(End view)

S-Loop Wrap Plug
PN 8547629

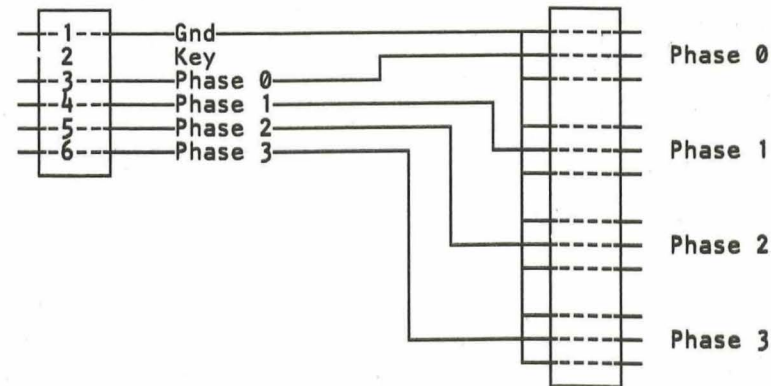


S-Loop Wrap Plug Wiring



S-Loop Plug
(End view)

Head Alignment Cable
PN 5687099



PN 5687026 01 APR 81
Present EC: 344569
Previous EC: None
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Chapter 6. Parts Catalog

Figure 1. Maintenance Device Model 2 6-2

Figure 2. Final Assembly 6-4

Figure 3. Logic Assembly 6-6

Figure 4. Diskette Drive Assembly 6-8

GLOSSARY

- 1 NO NO - When this notation appears in the Part No. column, it denotes a part or group of parts that have not been assigned a part number or which are not recommended for field replacement.
- 2 NR - This notation in the Part No. column denotes a part not recommended for field replacement.
- 3 NP - This notation in the Part No. or Description column indicates parts that are non-procurable. In these cases the next higher assembly should be ordered.
- 4 AR - The notation AR in the Units Per Asm. column indicates that the quantity of the part is used as required.
- 5 SIMILAR ASSEMBLIES - If two or more assemblies contain a majority of identical parts, they are combined in the same listing. Parts common to assemblies are illustrated and listed by one index number. Parts peculiar to one or the other of the assemblies are listed separately and identified either in the description of the part, or by a descriptive trailer line.
- 6 REF - The notation REF in the Units Per Asm. column indicates that the listing of the assembly is repeated and reference should be made to its previous listing for the quantity required.
- 7 INDENTURE - The indentation of items under the numerals 1 through 4 at the head of the Description column shows the relationship between assemblies, subassemblies and detail parts. For example:
- | | | | | |
|-------------|---|---|-------|----------------------------------|
| | 1 | 2 | 3 | 4 |
| (No dot) | | | | MAIN ASSEMBLY |
| (One dot) | | | • | Detail parts of main assembly |
| (One dot) | | | • | Assembly within main assembly |
| (Two dot) | | | • • | Detail part of one dot assembly |
| (Two dot) | | | • • | Assembly within one dot assembly |
| (Three dot) | | | • • • | Detail parts of two dot assembly |
- 8 ATT PT - This notation in the Description column is used to denote hardware that attaches assemblies, subassemblies and detail parts to the next higher assembly. The attaching hardware is listed immediately following the part to be attached.

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FIGURE 1. MAINTENANCE DEVICE MODEL 2

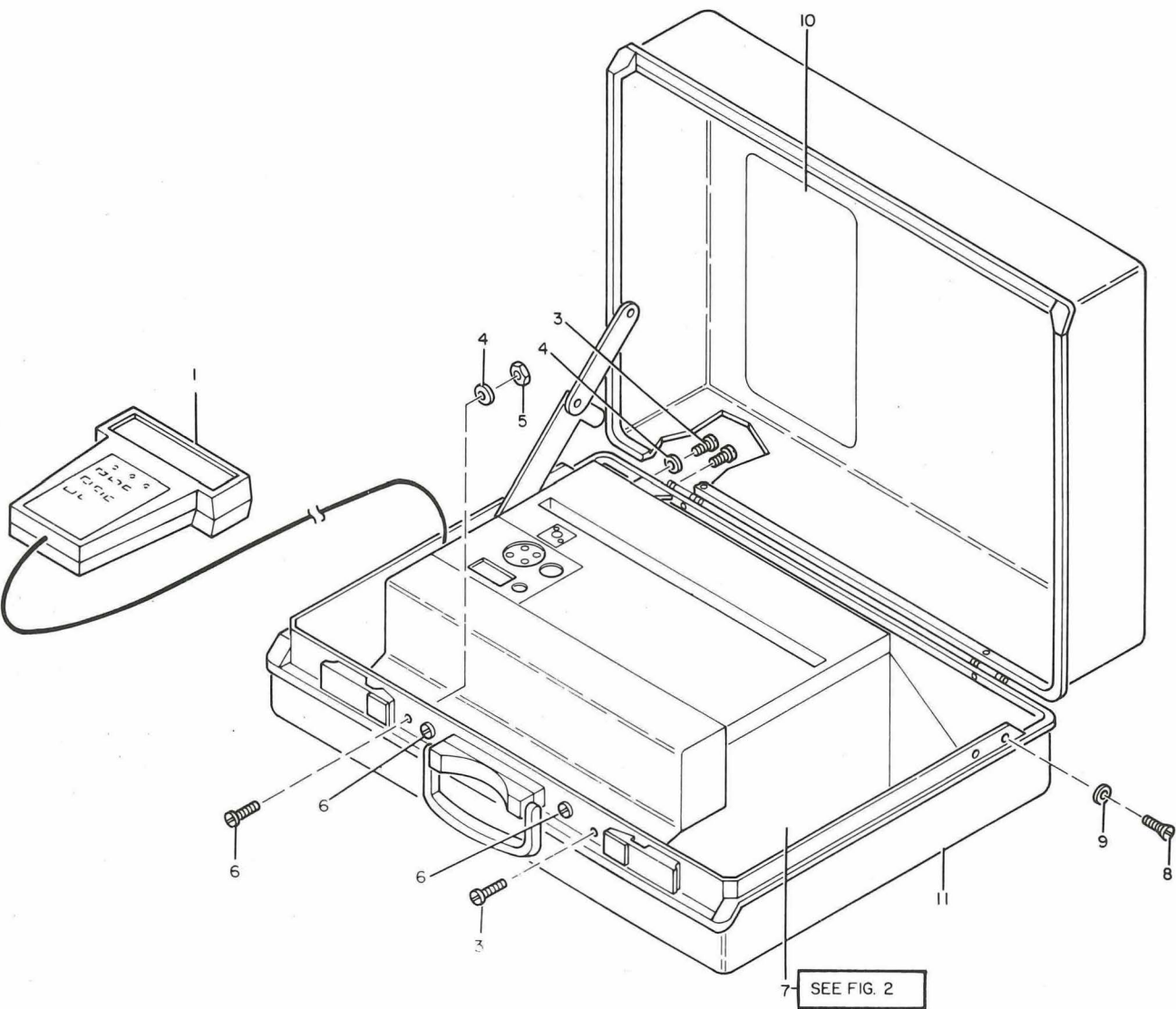


FIGURE 1 LIST

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION			
			1	2	3	4
1 -	5687075 NP	1	FINAL ASSEMBLY-MD- 2			
- 1	5687030	1	FOR ILLUSTRATION SEE FIGURE 1			
- 2	5687015	1	• KEYBOARD DISPLAY AND CABLE ASSEMBLY			
- 3	1621170	3	• • CABLE ASM-KEYBOARD DISPLAY			
- 4	1622302	3	• SCREW,PAN HD- M3 X L 6			
- 5	1622401	1	• WASHER,FL-M3 7 OD X 0.5 THK			
- 6	1621171	3	• NUT,DBL CHAMFERED HEX M3 X 2.4 THK			
- 7	5687072 NP	1	• SCREW,PAN HD- M3 X 8 LG			
- 8	1621284	2	• CHASSIS ASSEMBLY			
- 9	1622302	2	FOR DETAIL BREAKDOWN SEE FIGURE 2			
- 10	5687066	1	• SCREW,FLAT HD-M3 X 0.5 LG			
- 11	5687065 NP	1	• WASHER,FL-M3 7 OD X 0.5 THK			
			• DECAL			
			• CARRYING CASE			
				ATT PT		
				ATT PT		

FIGURE 2. FINAL ASSEMBLY

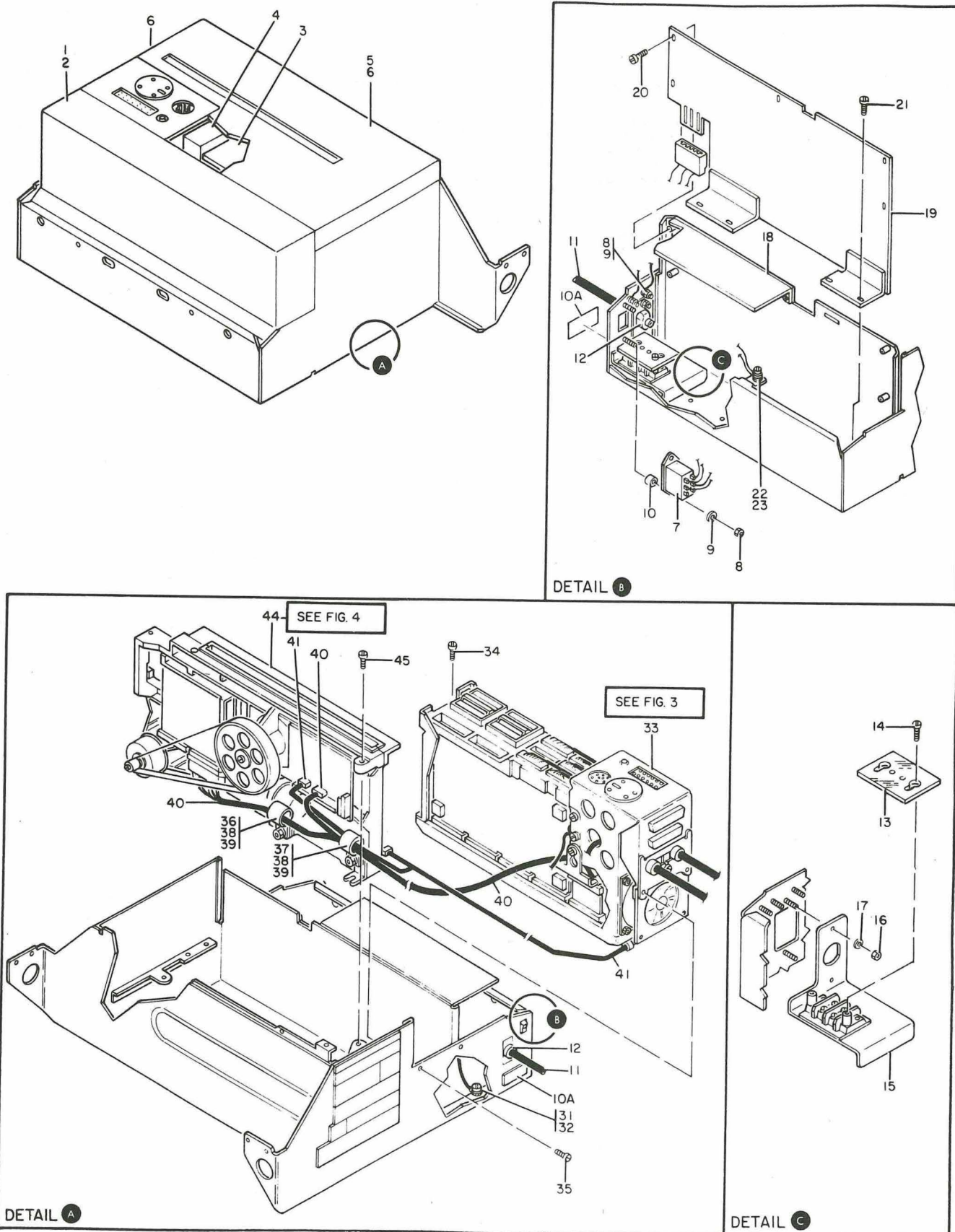
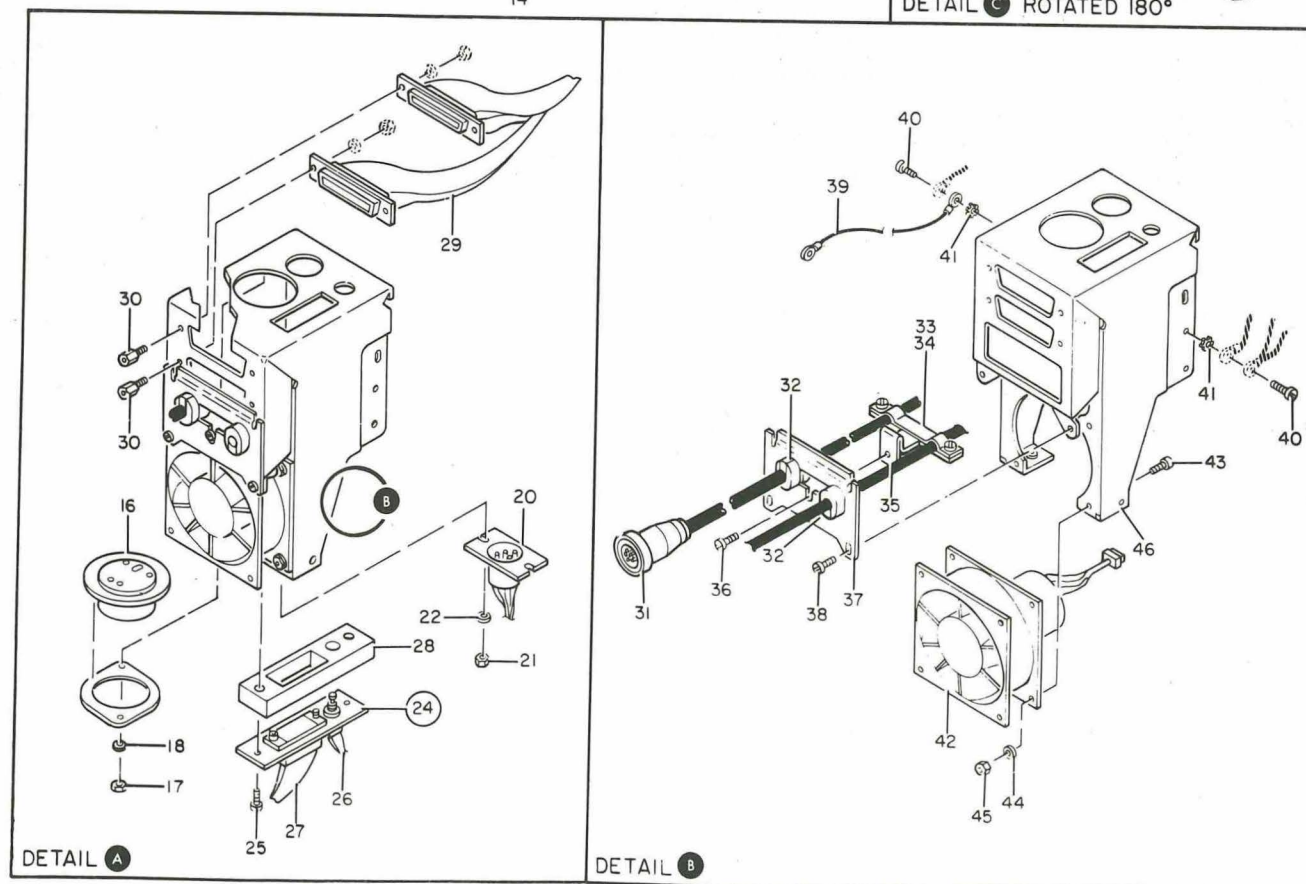
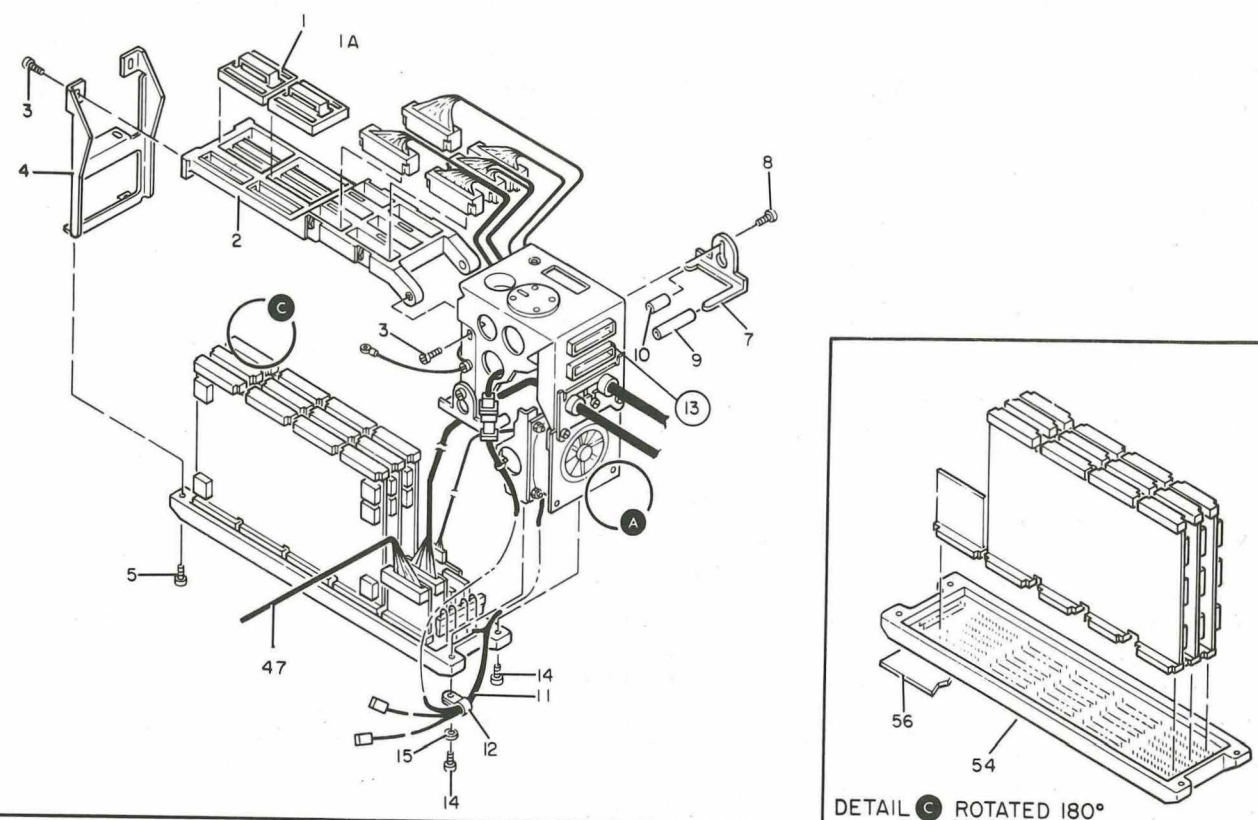


FIGURE 2 LIST

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	CHASSIS ASSEMBLY				DESCRIPTION
			1	2	3	4	
2 -	5687072 NP	REF					CHASSIS ASSEMBLY FOR NEXT HIGHER ASM SEE FIGURE 1-7 FOR ILLUSTRATION SEE FIGURE 2
- 1	5687059	1					• COVER-POWER SUPPLY
- 2	1621170	2					• SCREW,PAN HD- M3 X L 6- ATT PT
- 3	5687080	1					• LABEL
- 4	5687091	1					• FOAM BLOCK
- 5	5687060	1					• COVER
- 6	5687078	3					• SCREW ATT PT
- 7	5687018	1					• POWER SWITCH AND CABLE ASSEMBLY
- 8	1622401	2					• NUT,DBL CHAMFERED HEX M3 X 2.4 THK ATT PT
- 9	1622302	2					• WASHER,FL-M3 7 OD X 0.5 THK ATT PT
- 10	2277137	2					• SPACER ATT PT
- 10A	845762	1					• PLATE,VOLTAGE
- 11	5687048	1					• LINE CORD ASM- 60HZ
- 11	5687089	1					• LINE CORD ASM- 50HZ
- 12	5687081	1					• STRAIN RELIEF
- 13	5319909	1					• SHIELD,SAFETY
- 14	10170	2					• SCREW, MACH, BH, 6-32 X 1/4 LG ATT PT
- 15	5686984	1					• TERMINAL BLOCK ASM
- 16	1622401	2					• NUT,DBL CHAMFERED HEX M3 X 2.4 THK ATT PT
- 17	1622302	2					• WASHER,FL-M3 7 OD X 0.5 THK ATT PT
- 18	4499631	1					• SAFETY LABEL ASSEMBLY
- 19	5687035	1					• CARD-POWER SUPPLY
- 20	1621172	5					• SCREW,PAN HD- M3 X 10 LG ATT PT
- 21	1621170	4					• SCREW,PAN HD- M3 X L 6- ATT PT
- 22	1621170	1					• SCREW,PAN HD- M3 X L 6-
- 23	1622344	1					• LOCKWASHER,EXT STAR- M3 X 294 THK
- 31	1621176	1					• SCREW,PAN HD-M3 X 4 LG
- 32	1622344	1					• LOCKWASHER,EXT STAR- M3 X 294 THK
- 33	5687073 NP	1					• LOGIC PACKAGE ASSEMBLY FOR DETAIL BREAKDOWN SEE FIGURE 3
- 34	1621170	2					• SCREW,PAN HD- M3 X L 6- ATT PT
- 35	5687078	2					• SCREW ATT PT
- 36	167338	1					• CLAMP
- 37	356742	1					• CLAMP,LOOP-0.250 ID
- 38	1622401	2					• NUT,DBL CHAMFERED HEX M3 X 2.4 THK ATT PT
- 39	1622304	2					• WASHER,FL- M4 9 OD X 0.8 THK ATT PT
- 40	5687013	1					• CABLE ASM-DISKETTE DRIVE
- 41	5687014	1					• CABLE ASM-DC DISTRIBUTION
- 42	5687013	1					•
- 43	5687024	1					• HEAD
- 44	5686961	1					• DISKETTE DRIVE ASSEMBLY FOR DETAIL BREAKDOWN SEE FIGURE 4
- 45	1621185	2					• SCREW, MACH-PAN HD ATT PT

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FIGURE 3. LOGIC ASSEMBLY



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FIGURE 3 LIST

LOGIC PACKAGE ASSEMBLY			
FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION
3 -	5687073 NP	RLF	LOGIC PACKAGE ASSEMBLY FOR NEXT HIGHER ASM SEE FIGURE 2-33 FOR ILLUSTRATION SEE FIGURE 3
- 1	5687052	2	• CROSSOVER ASSEMBLY
- 1A	4788697	1	• CROSSOVER, 7880
- 2	5687061	1	• RETAINER, LOGIC CARD
- 3	1621171	2	• SCREW, PAN HD- M3 X 8 LG
- 4	5687056 NP	1	• BRACKET
- 5	1621173	2	• SCREW, PAN HD-M3 X 12 LG
- 6	1159913	1	• CLAMP, STRAP CAM STAY
- 7	5687064	2	• RETAINER, CABLE
- 8	1621170	2	• SCREW, PAN HD- M3 X L 6
- 9	4483286	2	• INSULATOR
- 10	4483287	2	• INSULATOR
- 11	5687014	1	• CABLE ASM-DC POWER
- 12	356742	1	• CLAMP, LOOP-0.250 ID
- 13	5687074 NP	1	• CONNECTOR PANEL ASSEMBLY
- 14	1621173	2	• SCREW, PAN HD-M3 X 12 LG
- 15	1622302	1	• WASHER, FL-M3 7 OD X 0.5 THK
- 16	5687053	1	• JACK, S-LOOP
- 17	1622401	2	• NUT, DBL CHAMFERED HEX M3 X 2.4 THK
- 18	1622316	2	• WASHER, SPRING-M3 6.2 OD X 0.8 THK
- 20	5687012	1	• CABLE AND CONNECTOR ASSEMBLY
- 21	1622401	2	• NUT, DBL CHAMFERED HEX M3 X 2.4 THK
- 22	1622316	2	• WASHER, SPRING-M3 6.2 OD X 0.8 THK
- 24	5687009	1	• CABLE ASM-P10-IPL
- 25	1621170	2	• SCREW, PAN HD- M3 X L 6
- 26	5687017	1	• CABLE ASM-IPL RESET
- 27	5687010	1	• CABLE ASM-P10
- 28	5687092	1	• FOAM SHROUD
- 29	5687011	1	• CABLE ASSEMBLY
- 30	5922560	4	• STANDOFF EIA CONNECTOR NUT AND WASHER INCLUDED
- 31	5687016	1	• CABLE ASSEMBLY
- 32	1138167	2	• BUSHING, STRAIN RELIEF
- 33	5687102 NP	1	• BONDING CLAMP
- 34	1621172	2	• SCREW, PAN HD- M3 X 10 LG
- 35	5687101 NP	1	• BONDING BRACKET
- 36	1621176	1	• SCREW, PAN HD-M3 X 4 LG
- 37	5687100 NP	1	• CABLE BRACKET
- 38	5687078	2	• SCREW
- 39	5686999 NP	1	• JUMPER
- 40	1621171	2	• SCREW, PAN HD- M3 X 8 LG
- 41	1622344	2	• LOCKWASHER, EXT STAR- M3 X 2.94 THK
- 42	5687021	1	• FAN ASSEMBLY
- 43	1621171	4	• SCREW, PAN HD- M3 X 8 LG
- 44	1622302	4	• WASHER, FL-M3 7 OD X 0.5 THK
- 45	1622401	4	• NUT, DBL CHAMFERED HEX M3 X 2.4 THK
- 46	5687058 NP	1	• CONNECTOR PANEL ASSEMBLY
- 47	5687013	1	• CABLE ASM-DISKETTE DRIVE
- 54	5687004	1	• BOARD ASM
- 56	NO NO.	AR	• TAPE, INSULATOR

FIGURE 4. DISKETTE DRIVE ASSEMBLY

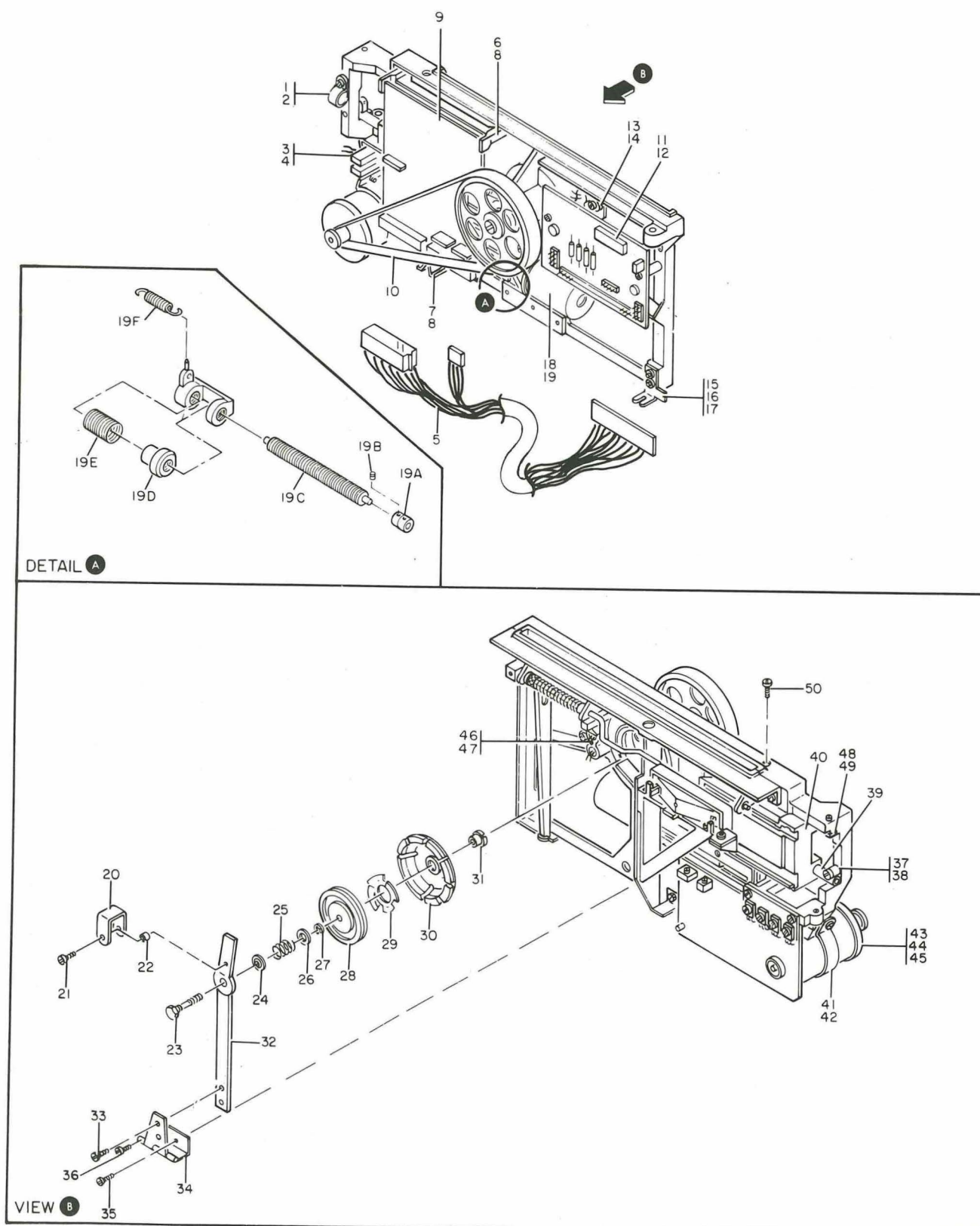


FIGURE 4 LIST

DISKETTE DRIVE ASSEMBLY			
FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM.	DESCRIPTION
4 -	5686961	REF	DISKETTE DRIVE ASSEMBLY FOR NEXT HIGHER ASM SEE FIGURE 2-44 FOR ILLUSTRATION SEE FIGURE 4
- 1	70500	1	•
- 2	1621171	2	• SCREW,PAN HD- M3 X 8 LG ATT PT
- 3	8493726	1	• OPTICAL TRANSDUCER
- 4	1621172	1	• SCREW,PAN HD- M3 X 10 LG ATT PT
- 5	5687024	1	• CABLE ASM
- 6	5686965	NP	• RETAINER,CARD
- 7	5686967	1	• RETAINER,CARD
- 8	1621170	4	• SCREW,PAN HD- M3 X L 6 ATT PT
- 9	4178065	1	• CARD ASM,DISKETTE CONTROL
- 10	5686915	1	• BELT
- 11	8677614	1	• CARD ASM
- 12	1621170	2	• SCREW,PAN HD- M3 X L 6 ATT PT
- 13	5686958	1	• PTX ASSEMBLY
- 14	1621190	1	• SCREW,PAN HD- M4 X 8 LG ATT PT
- 15	5687047	NP	• SUPPORT
- 16	1621173	NP	• SCREW,PAN HD-M3 X 12 LG ATT PT
- 17	1621170	NP	• SCREW,PAN HD- M3 X L 6 ATT PT
- 18	5687032	1	• MOTOR,STEPPER AND CABLE ASM
- 19	338238	2	• SCREW,BD HD- 4-40 X 0.312 LG ATT PT
- 19A	4499629	1	• COLLAR
- 19B	1621703	1	• SET SCREW ATT PT
- 19C	5686943	1	• LEAD SCREW
- 19D	2305627	1	• NUT,SPECIAL-CARRIAGE LOADING ATT PT
- 19E	2305628	1	• SPRING
- 19F	58853	1	• SPRING
- 19G	5687022	1	• NUT,CARRIAGE
- 20	5687041	NP	• KEEPER
- 21	1621003	1	• SCREW-MACH CHEESE HD,M2 X 10 LG ATT PT
- 22	5687043	NP	• SPACER ATT PT
- 23	5686940	NP	• STUD
- 24	5686928	NP	• WASHER
- 25	5686913	NP	• SPRING
- 26	5686928	NP	• WASHER
- 27	1073418	NP	• RETAINER,CRANK
- 28	4240612	1	• CONE ASM
- 29	4240649	NP	• SPRING
- 30	4240611	1	• COLLET
- 31	4240637	NP	• NUT
- 32	5686941	NP	• SPRING,LEAF
- 33	1621176	2	• SCREW,PAN HD-M3 X 4 LG ATT PT
- 34	5686921	NP	• HINGE
- 35	1621170	1	• SCREW,PAN HD- M3 X L 6 ATT PT
- 36	1621173	1	• SCREW,PAN HD-M3 X 12 LG ATT PT
- 37	5686948	NP	• CLAMP
- 38	1621173	2	• SCREW,PAN HD-M3 X 12 LG ATT PT
- 39	5686935	NP	• ROD,GUIDE
- 40	4178035	1	• CARRIAGE ASM,HEAD
- 41	5686931	NP	• STRAP,MOTOR
- 42	1621171	NP	• SCREW,PAN HD- M3 X 8 LG ATT PT
- 43	8677656	1	• CARD ASM
- 44	1621170	2	• SCREW,PAN HD- M3 X L 6 ATT PT
- 45	638073	2	• WASHER ATT PT
- 46	5686959	1	• L.E.D.ASM
- 47	1621190	1	• SCREW,PAN HD- M4 X 8 LG ATT PT
- 48	5686942	NP	• BAR,GUIDE
- 49	1621002	1	• SCREW-MACH CHEESE HD,M2 X 8 LG ATT PT
- 50	1621004	NP	• SCREW-MACH CHEESE HD,M2 X 12 LG ATT PT

Chapter 7. MD Application/Utility Programs

Application/Utility Programs Description

Several programs, grouped as application or utility programs, are available on the Maintenance Device (MD) maintenance diskette. These programs should be used only at the request of maintenance support groups.

The programs are:

List Volume Table of Contents (VTOC) Utility

This program is used to display the diskette volume table of contents.

Rule Log Utility

This program is used to display the product engineering log (PELOG) data.

Step Log Utility

This program is used to display step text using step entries in the product engineering log (PELOG).

Dump Analyzer

This program is used to analyze the data from a MD program check dump.

Remote Processor

This program supplies a method of activating remote maintenance, through a data link, on a device or product under test.

Dump Transmit (Xmit) Program

This program supplies a method to transmit dump data from a diskette to a remote location through a data link.

Print Diskette Utility

This program supplies a method to transmit a hexadecimal diskette, converted to print format, to a remote location through a data link.

Binary Synchronous Request for Test (BISYNC RFT) Utility

This program is used to test the modem and the MD communications ability using the EIA port.

Display Alter Utility

This program is used to display and/or change diskette data.

Copy Diskette

This program can be used to copy data from diskette to diskette or from one location to another.

Disk Analysis Utility

This program is used to check for read failures on a diskette.

Head Alignment Utility

This program, with an alignment diskette, aids the MD file head alignment procedure.

These programs are grouped into three groups. A list is displayed for selecting a group, and a second list is displayed for specific program selection in that group.

Following is the display for selecting the group.

SELECT UTILITY TYPE

1. DISPLAY
2. REMOTE
3. DISKETTE

One of the following lists is displayed for the respective group.

DISPLAY

1. LIST VTOC
2. RULE LOG
3. STEP LOG
4. DUMP ANALYZER

REMOTE

1. REMOTE PROCESSOR
2. DUMP XMIT PROGRAM
3. PRINT DISKETTE
4. BISYNC RFT TEST

DISKETTE

1. DISPLAY ALTER
2. COPY DISKETTE
3. DISK ANALYSIS
4. HEAD ALIGNMENT

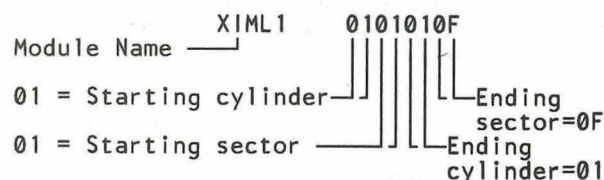
Note 1: The messages sent to the user prompt for the correct response. In some cases, the reference (REF) light is turned on, indicating additional information is available.

These programs permit the user to change diskettes at the start of each section. An IPL may or may not be needed to restart from the end of the utility if a new diskette has been installed.

Note 2: The location of program modules is specified by their starting and ending extents. An extent is the hexadecimal address of a physical location on the diskette.

List Volume Table of Contents (VTOC) Utility

The List VTOC utility formats and displays data from the user directory. Four lines at a time are displayed. Each line displays a module name and its starting and ending extents. The following figure shows how to interpret the information displayed:



Rule Log Utility

The Rule Log utility formats and displays the product engineering Log (PELOG). The PELOG is a trace containing a list of instruction (Rule) addresses executed by the MD. This trace is kept in the MD and is used to record the path taken through a maintenance procedure. The Rule Log utility formats and displays these instruction addresses in 32-byte sections with one blank between each two-byte group displayed.

Step Log Utility

The Step Log utility displays STEP information if this information was included in the MAP. The MAP module name, step number, log number, step address, and the text information for the step is recorded in the PELOG.

Dump Analyzer

The Dump Analyzer program formats and displays data from a MD program check dump. This program displays the following information:

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Program Check Code

MDIL Rule ID

MDI Module Name and Level

MDCP Module Name and Level

MDCP Failing Macro ID

MDCP Failing Macro Address

MDCP Failing Macro Parameters

This information may be needed to determine the cause of the MD program check.

Remote Processor

The Remote Processor program permits the MD to be controlled from a central site. The central site transmits commands for the MD to execute. The MD checks the data link for these commands and, when one is recognized, performs the command, responds with status, and continues checking for additional commands.

This application permits the central site to:

- Execute the product maintenance procedure
- Load and execute diagnostic programs
- Perform functions usually associated with product CE panels if the product adapter has these functions
- Read files from the product maintenance diskette
- Update the product maintenance diskette

By using this program, the central support personnel can observe the action between the MD and the product and the real problem observed by the CE. This program also permits analyzing design errors in the maintenance procedures.

Dump Xmit Program

This Dump Xmit program is used to send data through a data link from an 8100 stand alone dump diskette to a specified user. To communicate through the data link, the receiving location must supply addressing and control information to activate the data link. This must be done before attempting to execute the program. Compatible modems operating at 1200 bits per second (bps) are necessary. Transmitted data is not formatted, and a format program is needed at the receiving location.

The files to be transmitted are identified by labels written on track 0 of the 8100 dump diskette. These labels supply the program with information for locating and sending the data automatically. Flags are kept to permit restarting

a dump transmission without sending preceding files again. Status messages are displayed during the transmission.

Note: This program is for the 8100 Distributed Processing Control Executive (DPCX) software only. Questions about the use of the Dump Xmit program should be communicated to DPCX Central Service Support.

Print Diskette Utility

The Print Diskette utility reads data from a specified diskette track and sector, translates it into EBCDIC, formats it in one of two 80-character forms, and then sends it to the EIA port.

Binary Synchronous Request for Test (BISYNC RFT) Utility

The BISYNC RFT Test utility is used to test the MD and the DCEs (modems) used to transmit data between locations. This utility supports RFT tests 01, 14, and 19 run at 1200 bps. See *Teleprocessing Support Center Reference Summary*, ZZ27-0001, for more information.

Display Alter Utility

The Display Alter utility supplies a method of displaying and changing diskette data. The user is requested to enter the diskette extents to be displayed or changed. The utility reads the data from the diskette extents and stores it in MD storage. After the data has been read into storage, it can be displayed, changed, and written back to the diskette. Thirty-two bytes of data are displayed on each 80-character display. A displacement value must be supplied to use these functions. The three low-order digits of the data displacement are displayed in the first three display positions on each line of the display. This displacement value is the displacement from the starting diskette extents supplied by the user.

Copy Diskette

The Copy Diskette program permits the user to copy diskettes. The program may use one or two Maintenance Devices to do the copying. Copying may also be to or from a remote MD.

When using one MD, the program reads data from one diskette (source) into the MD storage. The source diskette is then exchanged for another diskette (target), and the data is written

onto this diskette from the MD storage. If all the data to be copied cannot be read into the MD storage, part of it is read into storage, and the user is instructed to exchange diskettes as needed.

The program issues status messages to indicate the diskette address being copied.

When using two Maintenance Devices, the program copies from a diskette in one MD to a diskette in another MD. The two MDs may be local or one MD may be remote from the other MD. The telecommunication lines must have compatible modems when copying from or sending to a remote location. The transmission speed is selected by the user from one of three speeds: 600, 1200, or 2400 bits per second.

The program supports three diskette types:

- Diskette Type 1 -- 128- and 256-byte sectors
- Diskette Type 2 -- 256-byte sectors
- Diskette Type 2D -- 256-byte sectors

The source and target diskettes must be compatible in order for them to be copied correctly.

A cylinder of thirty 256-byte sectors takes approximately 90 seconds to copy. Cylinder sizes are different for each of the diskette types.

Disk Analysis Utility

The Disk Analysis (DKAN) utility is used to verify that the diskette can be read. The utility scans the diskette and displays a message for each error that is sensed. The utility issues requests to prompt the user for the needed input information.

Head Alignment Utility

This utility is to be used only in special situations at product engineering's request.

The Head Alignment utility positions the MD's file head at cylinder 40. The user can then replace the maintenance diskette with an alignment diskette without head movement. With the aid of an oscilloscope and the alignment diskette, the user can check the diskette drive head alignment.

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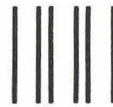
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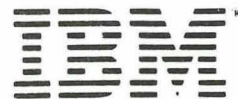
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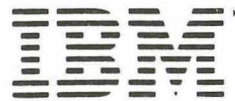
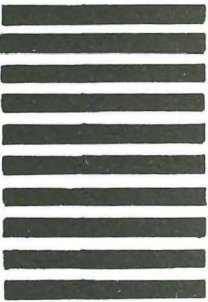
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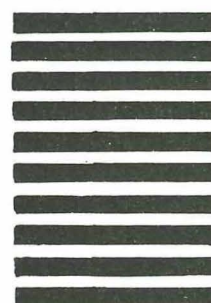
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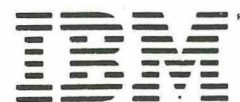
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